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Powerful gaming chops in a portable package?

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FIPP

WHERE MICROSOFT GOT IT WRONG

It's barely a year old, but Microsoft's Windows RT operating system is already looking like it's dead in the water.

You don't have to be a die-hard Mac fan to realise that there's probably some truth to the accusation that Microsoft's original Windows design was at least partly inspired by Apple's early MacOS designs.

With Windows 8 and RT, it could be said that Microsoft has, once again, essentially tried to clone Apple's business model. The two-pronged approach of both companies sees them offering an open system (Windows 8 and Mac OS X) for 'real' PCs and a closed one (Windows RT and iOS) for tablet products.

This time around, however, Microsoft may have picked the wrong company to 'borrow' from. It's that latter half of this strategy that's seemingly proved to be a big mistake; by trying to ape Apple's tablet formula, Microsoft has abandoned the core which helped it reach the top of the tech tree in the first place. Despite what the Linux faithful may preach, Windows is a fairly open platform, letting you freely run software as you see fit. Windows RT, which can only run Modern UI apps downloaded from the Microsoft Store, is a closed and highly restrictive platform.

At the time Microsoft set its RT plans, with Apple dominating both the tablet and smartphone markets, I'm sure copying the iOS strategy looked like a good idea. But with Android now filling out the bulk of the mobile space – Google's OS captured 80% of worldwide smartphone sales and two-thirds of the tablet market (30 million vs 15 million) in the second quarter of 2013 – it looks like Microsoft's plan could be a costly (and time-consuming) mistake.

It's not only resulted in lost sales and huge inventories of unsold Surface RT tablets. But the RT debacle has also given Apple and Google time to further polish and expand their own platforms and even start to venture into territory that Microsoft typically dominates. Take office apps, for example. Last month, first Apple and then Google made their mobile office suites free, showing that going after the business market is a clear goal for both.

Microsoft's still a massive player with very deep pockets, and it's undoubtedly got the cash to play the long game when it comes to smartphones and tablets. But with two very entrenched adversaries, it looks like it's in for a tough, long and protracted fight.

A NOTE ON THE REDESIGN

You'll have noticed by now that *APC*'s undergone a bit of a visual refresh this month. It's been over five years since we've had a proper redesign, but we've taken a fairly softly-softly approach to this one, giving the old girl a lick of paint but not messing with anything that we felt was already working fine.

That said we want to hear from you about what you think of it too. Feel free to chime in about what parts of the redesign you like (or don't) by sending us an email to **apcmag@futurenet.com**.

Dan Gardiner
Editor
dangardiner@futurenet.com

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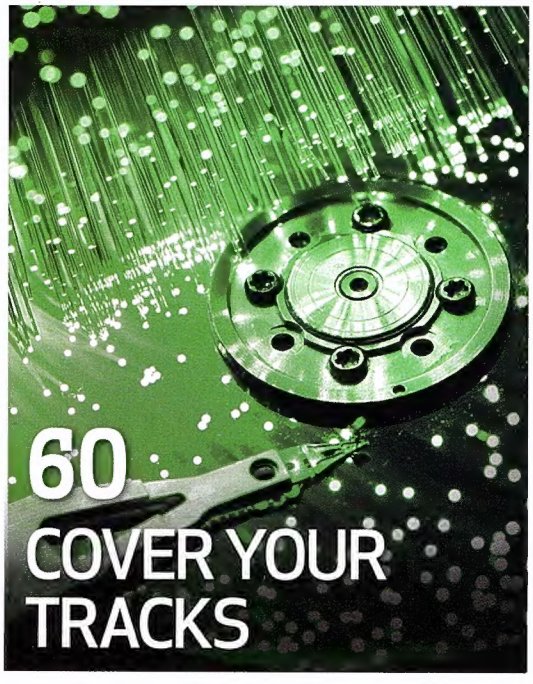
Revealed: the hidden features & essential apps you need to make Windows 8 great!



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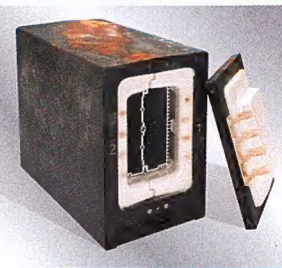

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Find your disc inside on page 67.

Gabe Newell has been very vocal in his disdain of Windows 8.

Steam's controller — we like to call it the 'Stickless Joypad'.

Can Valve ignite a Linux gaming revolution?

The gaming giant makes a serious play for the lounge room with its new SteamOS. Can it really succeed?

In the last week of September, Valve announced its new tri-fold strategy, saying that in 2014 it'll deliver three things that could change the face of PC gaming forever. All three are, to an extent, designed primarily with lounge room PC gaming in mind.

The first of them is a free Linux-based OS, called SteamOS, that'll use a 10-foot interface that's suitable for displaying on TVs and interaction using games controllers.

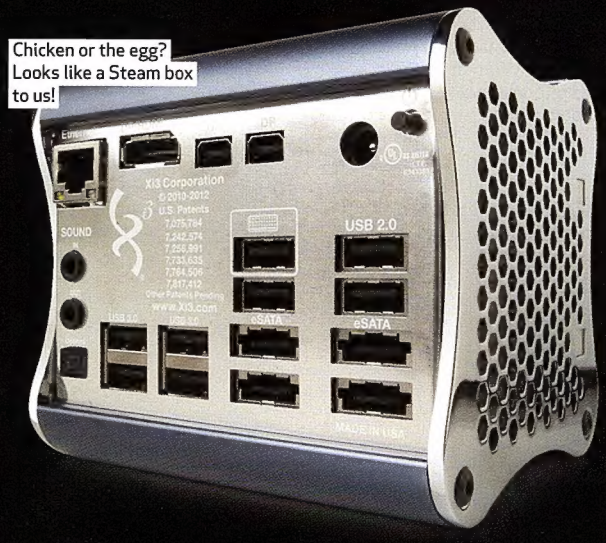
The second is a variety of Steam Machines — purpose-built PCs made to run that Steam OS. Valve itself won't create one 'official' Steam Machine, but will instead encourage third parties to build a wide variety of devices, letting users choose what works best for them.

And the last (and possibly most exciting) is the company's Steam Controller, a gamepad designed to work specifically with the new SteamOS.

It's an ambitious plan, and not just because it's a product that, in effect, is in direct competition with Sony's PlayStation 4 and Microsoft's Xbox One. Because to get it to work, Valve will not only need to convince consumers that this is a better option than what Sony and Microsoft has to offer — it'll have to get the game makers on board too.

Linux has almost always fallen a distant third when it comes to desktop PC gaming and a lot of that just comes from the platform's low market share. Linux typically lurks around the 1-3% area in worldwide operating system market share, with Mac OS X sitting at around 7% and Windows gobbling up the rest (around 90% at last count).

While you're more likely to see a simultaneous release on Windows, Mac and Linux right now than in any previous period, most of that support is coming from the indie development scene.



Chicken or the egg? Looks like a Steam box to us!

That's thanks in part to more cross-platform friendly game engines, like Unity. The real problem is that big guys haven't been so supportive. When it comes to popular game engines and Linux, it's a totally different story. While Valve supports the platform with its own Source engine, other major players like Unreal Engine 3, which has powered many of the big-name titles of the last generation, still don't have official Linux builds. While games can be and often are ported across to other platforms after initially launching on Windows, the costs of doing so are usually prohibitively high and, with Linux's tiny market share in particular, the projected payoff just isn't worth it.

Even with Valve's ambitious plan, we're still stuck with something of a chicken and egg situation then. Getting gamers to buy a Steam Machine will be a hard sell if there are no games to play. And getting game makers to support Linux will likewise be impossible if there's no one there to play them. ■

NOT DEAD YET

A recent report says PC gamers are holding the line against sagging hardware sales.

You've probably seen the reports that Dell's revenue is down a whopping 70 percent versus the same time last year. Acer says it's walking away from the Windows platform. Everybody's launching a line of tablets, and obsessing over announcements of a new bauble from Apple or Samsung has become a national pastime. Who has time for PCs anymore?

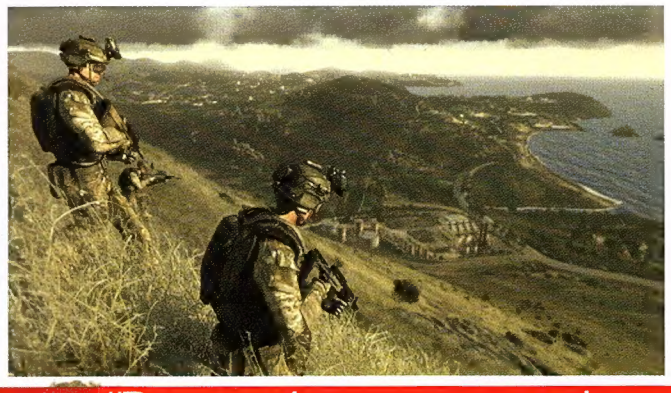
A lot of people, apparently. According to a recent report from Jon Peddie Research (JPR), PC gamers are like sports car enthusiasts, "always looking for more speed, power, utility, and handling." A number of people have transitioned their email, video streaming, and casual games over to mobile devices, but this phenomenon is more of an extension of the computing experience, rather than a wholesale shift. When asked for comment, Mr. Peddie said, "One of the misconceptions that — to my great annoyance — runs through the press and investment community is this football mentality that there is a winner and a loser, when in reality everyone is a winner. It is not a case of console or PC for gaming, any more than it is a choice of smartphone or console or PC or tablet for game playing."

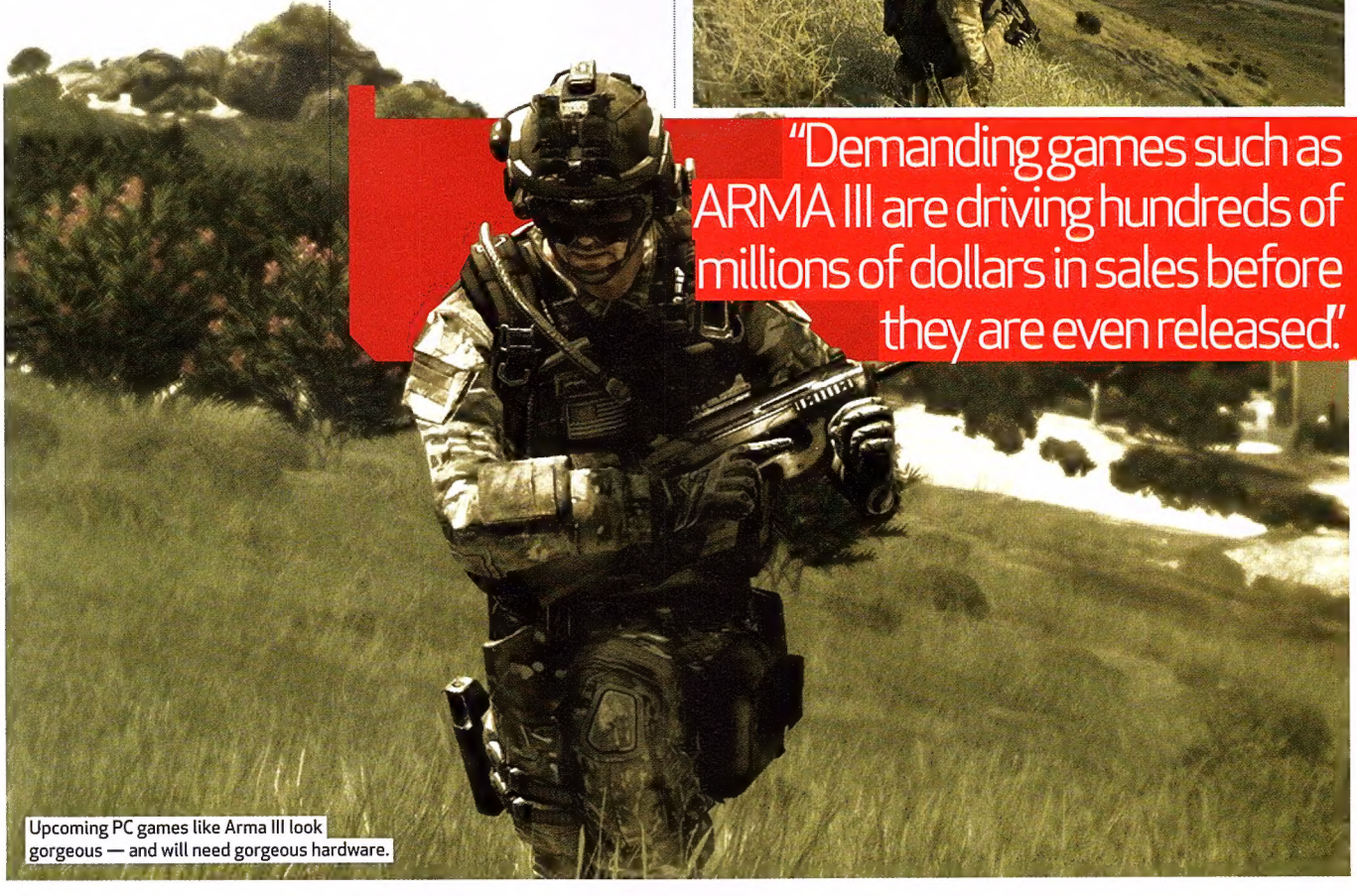
Globally, component sales have remained steady over the past couple of years. In recent informal talks with boutique shops, we've learned that sales are as strong as ever (though admittedly, they would not be eager to report a sudden decline). JPR is projecting that demanding games such as *ARMA III* are driving hundreds of millions of dollars in sales before they are even released, as gamers upgrade their systems (or build new ones) in anticipation of a jump in system requirements. This year, *ARMA III*'s developer announced that the game would require a quad-core AMD Phenom II CPU, an Intel Core i5, or better.

Part of the sustained drive of hardware sales may be the unusually long lifespan of the current generation of consoles. Our editorial inbox gets a constant flow of people moving away from consoles and into PC gaming. However, Jon Peddie has a different perspective: "Intermediate buying is influenced more by titles than hardware. If EA, for example, released a killer console game, it would sell well, even though the consoles are 10 years old. Likewise, if they released a great PC game, it would sell, and might influence the upgrade-buying of a new graphics add-in board. But it's always the content that drives it, not the announcements of the [hardware] suppliers."

That said, the PS4 and Xbox One moving to the PC's x86 instruction set looks like a major shift. Says Peddie: "Now, since the processors will all be x86 with rich GPUs and modern APIs, and the new machines can support up to 4K screens, the graphics quality of games will be equal from day one and the PC release of the game will be the same day as the console release. AMD will be announcing a new development tool to make that even more possible."

It looks like sales figures from Dell and other mass production OEMs don't tell the whole story. ■ **Tom McNamara**





"Demanding games such as ARMA III are driving hundreds of millions of dollars in sales before they are even released."

Upcoming PC games like Arma III look gorgeous — and will need gorgeous hardware.

1M+

ADOBE'S CREATIVE CLOUD PACKAGE EXCEEDS ONE MILLION SUBSCRIBERS

When Adobe announced its professional software design/imagery/video/web (and more) suite would cease being developed as a standalone boxed all-in-one and migrate entirely to a completely cloud-based subscription product, it sent more than a ripple through the industry. But despite some users' initial misgivings about the subscription-based model – and frankly, it's pretty limiting that in the future you won't be able to buy a boxed copy of Creative Suite to hold onto for keeps – uptake of Creative Cloud has been a decided success, with Adobe announcing more than one million subscribers are on board, with 1.25 million expected by the end of the year.

According to a recent industry report issued by security software makers Symantec, Hidden Lynx is a professional group of 'hackers for hire' based in China who have been in operation since 2009, staging cyber strikes against hundreds of organisations across some 15 countries. They're mostly focused on the US but are otherwise equal-opportunity hackers, with attacks across government, education, defence, finance, health and even non-profit organisations. To quote Symantec, they are "highly skilled, experienced professionals whose services are available for those willing to pay."

50-100

NUMBER OF HACKERS IN PRO-HACKING OUTFIT 'HIDDEN LYNX', AS ESTIMATED BY SYMANTEC

1

Can't run the latest app? Apple will let you download the last working version for your older iDevice

Running mobile software is a tricky game. Compared to the level of control you've got with a PC, if you update your mobile apps or operating system, it's impossible to roll back to previous versions without rooting or jailbreaking your device. In a move aimed at keeping users as 'appy as possible (ahem) across multiple versions of iOS, the App Store will now warn you if the current version of the app you're trying to download is incompatible with your older iOS device and offer you the last working version instead.

90%

TESLA PREDICTS ITS SELF-DRIVING CARS WILL BE IN CONTROL FOR 90% OF YOUR MILEAGE WITHIN THREE YEARS

Forget the space race. The new contest on the minds of industry giants worldwide is to be the first company to fully deliver on the promise of self-driving vehicles. Google, GM and Mercedes among others are all heavily invested in developing the tech, and Tesla's CEO Elon Musk is the latest to tease how graspingly close this still science-fiction-sounding goal could be. "We should be able to do 90 per cent of miles driven within three years... It's not speculation," he told the Financial Times, referring to his company's independent research.

10 TB

TENCENT UPS THE FREE STORAGE ANTE TO AN INSANE 10 TERABYTES

Forget what we said last month about Flickr's 1TB of free online photo storage being king of the hill – or cloud, as it were. No sooner had Flickr's owner Yahoo! trumpeted that spectacular deal than Chinese web giants Baidu and Weibo announced matching offers, but all have since been humbled by the mighty Tencent. Another Chinese tech titan, Tencent is providing users with a staggering (and frankly kind of silly) 10TB of free web storage. Hey Dropbox, are you gonna let them get away with this?

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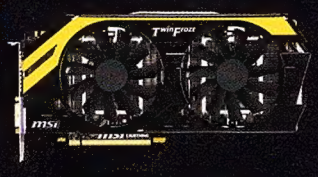

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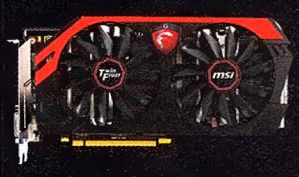

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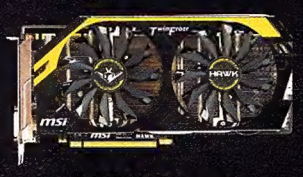

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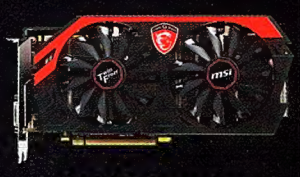

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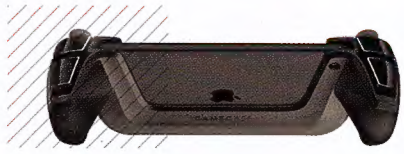


CLAMCASE GAMECASE

TBA | CLAMCASE.COM

Apple's newly minted iOS 7 isn't just a visual refresh of the iPhone/iPad operating system. It also brings with it official support for Bluetooth games controllers, and the GameCase is the first one to be announced. In essence, it's a device that your iPhone or iPad slots into and gives you more console like controls. If you've often longed for more precise controls than a touchscreen allows, these could be the answer. There's no word yet on price or release date.

PLANTRONICS RIG

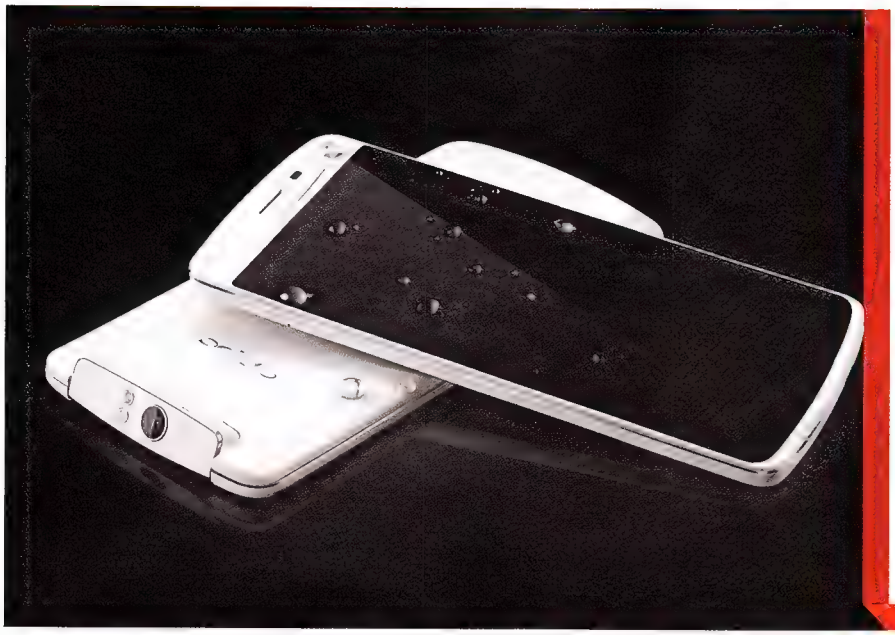
$150 | WWW.PLANTRONICS.COM.AU

Plantronics new gaming-pitched headset may look like most others at first glance, but they're designed to be smarter than your average pair of cans. The central trick is that they include a control pod that, on top of letting you control volume, equalisation and so on, also adds an extra input that's designed to let you keep using the audio functions of a secondary device like your smartphone. That means you can use the latter to make and receive calls, initiate voice chats and so on while you're listening to a game (or movie/TV show) through the headset. You can independently control the volume of different components too – turning down game audio so you can hear your own music playing back, for example. Audio multitasking FTW!

HYPERKIN RETRON 5

PRICE: US$100 | WWW.HYPERKIN.COM

For those of us who grew up in the 80s or early 90s the RetroN 5 is basically a dream machine – a little box that has the capabilities to play back all your old game carts (from NES, Super Nintendo and MegaDrive to the first three GameBoys) via all those gorgeous slots on its top and front. With support for basically every cartridge-based gaming system there ever was (well, barring the Nintendo 64), this is one console any 30-something geek would love to find under the Christmas tree. Time to dig out that old box of game cartridges in the garage, put on your Transformers jim-jams and get ready to party like it's 1985.



OPPO N1

TBA | EN.OPPO.COM

Chinese smartphone maker Oppo is largely unheard of outside of China, but its new N1 phone should make people sit up and take notice. It's the first Android phone to ship with CyanogenMod — a custom, community-built version of Google's mobile OS which is pitched at Android enthusiasts. The N1 is a big phone — there's a 5.9-inch screen, 1080p LCD display and a funky rotating 13MP camera. The build-quality looks reasonably tough, with a full metal aluminium alloy frame that's 9mm thick. That size does come at a price though, with the N1 weighing in at a slightly heavy 213g. On the downside there's no 4G and no microSD slot to expand the storage. There's no word on an Aussie release date, but Oppo says it will launch 'worldwide' in December.

NLO MOTO PREDATOR 2 HELMET

PRICE: US$780 (FREE SHIPPING) | NLO-MOTO.RU/EN

OK, we'll admit it straight off; there's nothing really tech-related about this motorbike helmet. There's no infrared, thermal or acoustic visual overlays and no targeting system for a shoulder-mounted rocket gun. Heck, there's not even any indication of whether it conforms to Australian road safety standards. But just look at that thing! It's so gnarly that no cop would dare pull you over. (Err, don't quote us on that one.) And hey, if you can't legally wear it on a bike, it's just as practical to wear at home while you're doing housework... vacuuming has never been this badass.

SAMSUNG GALAXY GEAR

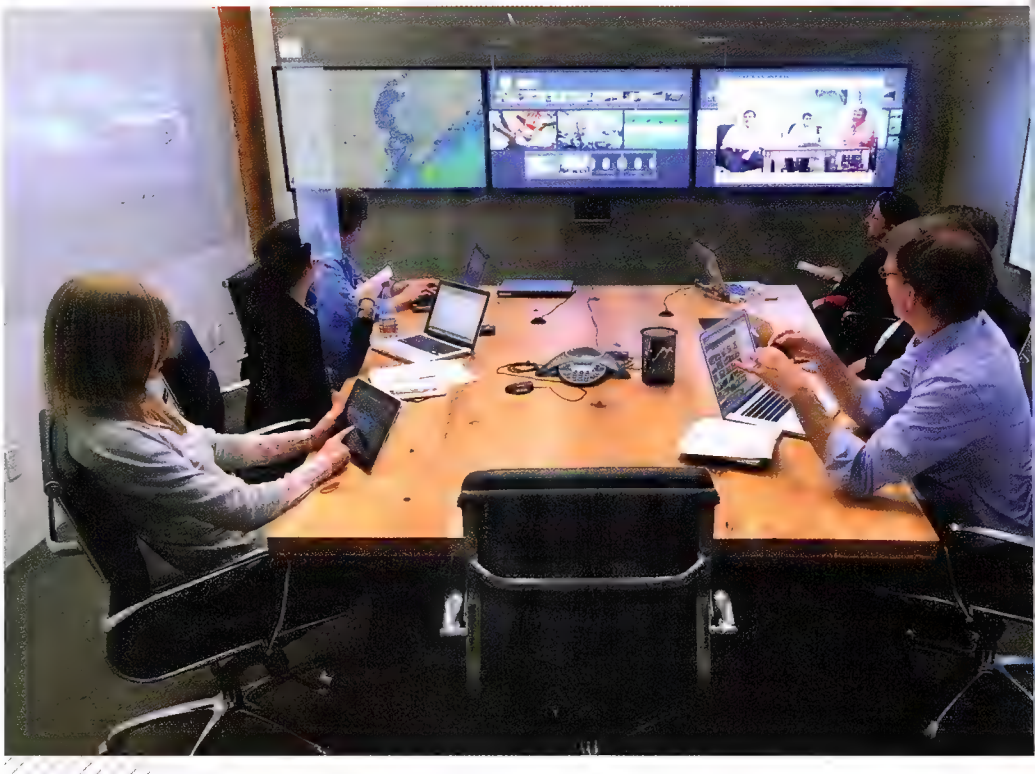
PRICE: $369 | WWW.SAMSUNG.COM/AU

2013 has undoubtedly been the year of the smartwatch; there's been a steady trickle of them over the last 12 months, culminating in this number from Android king Samsung. Along with time and weather functions, it has fitness tracking capabilities, reminders and call taking, ties in with Evernote for notes and has a 1.9MP camera in the band for snapping spy shots. Compatibility could be a bit of a stumbling block however — at launch, it'll only work with the brand-new, $999 Galaxy Note 3, though Samsung has stated that support for older Galaxy S phones should arrive before Christmas. It'll be available by the time you read this.

TALK, TOUCH, WAVE AND... BUZZ?

Mary Branscombe meets the digital user interfaces of the future.

We're long past keyboard and mouse being the default for computer control, but other than the touchscreen, so-called 'natural' user interfaces haven't really taken off. While some of the wackier ideas we saw at CES earlier this year – like brainwave wristbands – might never become mainstream, the newly-released Leap Motion and the upcoming Kinect 2 do give us an indication of what alternative inputs can look like. So what other interface technology is on the horizon?



Conference calls will be a lot more advanced than just dialling in to a phone number.

WAVE YOUR HANDS

Kinect isn't the only motion control system around. Oblong – a company based on technology created by the designer of the infamous Minority Report mid-air interface, John Underkoffer – has a (pricey) videoconferencing room system called Mezzanine that uses sensors mounted on the ceiling to let you drag documents around on the virtual whiteboard with a wand that also gives you a mouse button.

If you don't have the cash or the space for an installation like Mezzanine, you can use a Kinect, a PC, a projector and the Ubi software (**www.ubi-interactive.com**) that turns any surface into an interactive touch screen – the price starts at $149, depending on how large a screen you want. Want to see your recipes on the kitchen counter or *Angry Birds* on your bedroom wall? Ubi does that.

If you want something smaller than Kinect that lets you wave your hands at your PC or Mac, the long-awaited Leap Motion is now shipping (it'll cost you around $140 to get one shipped to Australia) and looks more akin to an Apple accessory than the angular – and quite large – Kinect.

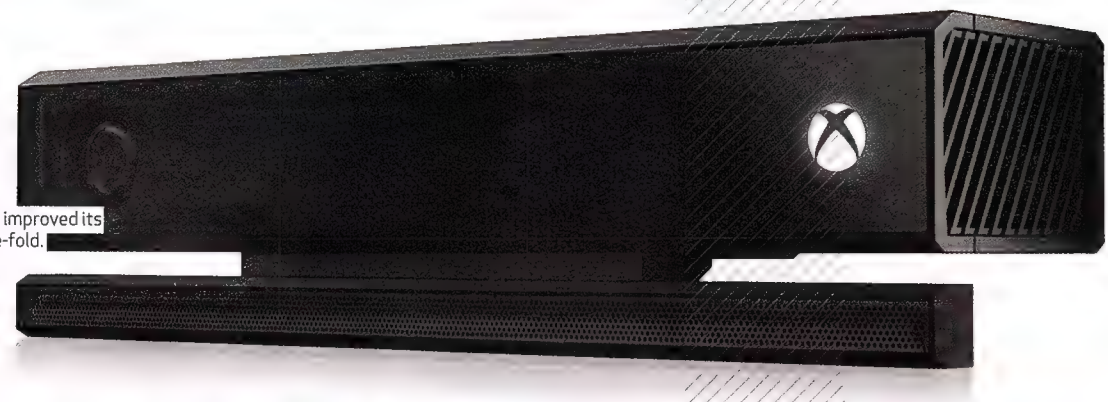
Although it's supposed to be a lot more sensitive than Kinect, it's still somewhat variable in use. Scrolling through documents and web pages works well for example, but doing something precise, like selecting an icon, can be tricky. Even though you can buy it, we're classing this as a work in progress.

With the right software, you could do much the same with the original Kinect on a PC – check out this video of Microsoft researcher Cem Keskin using his hands to paint in FreshPaint and zoom in Bing Maps: **tinyurl.com/k863tnv**

ONE FINGER WITH KINECT 2

Kinect 2, shipping with Xbox One, will be a lot more sensitive than the original Kinect; three times as sensitive in fact. Instead of a blur, it sees a pretty accurate 3D representation of whoever is

The Leap Motion is the Kinect's main rival at the moment.



The Kinect 2 has improved its sensitivity three-fold.

Ubi software turns any surface into a touchscreen.

standing in front of it. You can see lips moving when someone is talking or the wrinkles on their shirt.

The wider field of view means more people can play at once: we saw it detect six people at the same time at the Build conference, all dancing away.

And it can see further. During the demonstration we watched, the presenter had to walk off the stage to get out of range. The improved skeleton tracking picks up hand motions accurately. It can detect more of the joints in your hand, so it picks up finger and thumb movements too.

Microsoft says the voice recognition will be even better than the current Kinect. In our tests with the new fully voice enabled Sky app for Xbox, that's pretty reliable already.

With Kinect in the box, more developers will take advantage of it and it won't just be for games. If Xbox One is a success, Kinect 2 could be the next-generation interface is everyone's home. The combination of voice and gesture might show up at work too.

MULTIMODE AIR TRAFFIC CONTROL

Chris Wild of design company Altran Praxis told us about a possible system they're experimenting with for air traffic controllers.

As flight paths get scheduled further in advance instead of using today's ad hoc approach, sorting out routing problems without causing delays to other flights will get more difficult, so controllers need to work together closely.

In Altran's setup, the supervisor who needs an overview of all the air space they're responsible for stands at a large screen that shows them all the planes and routes in 3D. They can use gestures to get more information about any planes they're worried about, and wear a headset so they can speak to the system to allocate those aircraft to a specific controller — who might get the information on an iPad, drag the planes around on screen and send the new routes back to the big board.

Instead of just one interface, it's a multimodal system. You could gesture, talk or touch the screen for different tasks. You could even have different gestures for your left and right hands. And the technology isn't the real problem. The difficulty is in the execution, with issues such as working out how to take turns at talking, and perfecting the ergonomics of the system so users don't get backaches.

Wild suggests voice recognition systems could borrow a trick from the movie *2001* and use a camera to detect when you're talking

to them; "When I want to talk to someone in a crowded room, I look at them. You could put images on the wall of the room that hide the camera and you hold your gaze on an image for a couple of seconds so the computer knows you're addressing it."

At CES this year, we were impressed by the way Tobii's gaze tracking system uses what you're looking at on screen to scroll the right window or zoom the right part of the map, so maybe the combination of vision and sound is what we need.

Tobii's gaze tracking system uses your gaze to zoom and scroll.

FEEL THE FEEDBACK

But in the real world, points out Chris Ullrich of Immersion (the company which designs the haptic feedback used in most phones), "There's a deep seated human desire to get some kind of physical component to interactions. If you take that away, you lose your confidence in how things work. It's not conscious but it makes things feel unsatisfactory. As you increase the physical reality of an experience you increase the pleasure and satisfaction you get from it."

So painting on a tablet screen is fun, but it would feel more realistic if the paint that hadn't dried yet still felt 'wet' on screen. The same haptic feedback that buzzes when you type on your phone (or makes you feel that a marble rolling across the screen has fallen down a hole in a game) could do that.

In the longer term, an array of ultrasonic projectors or even a focused pulse of air against your hand could give you that feedback when you're making gestures without a touchscreen. More practical is giving people something to wear around their wrist. It might even be the smartwatch or a fitness tracking device you're already wearing.

The Fitbit Flex uses haptics to tell you when you've taken the number of steps to reach your daily goal. Why couldn't it also give you some feedback when your hand is in the right place to grab an icon in a gesture display? In three to five years, Ullrich thinks it will.

MAKE EVERYTHING A BUTTON

Haptic startup Redux Labs is taking a different approach using a combination of transducers that turn screens into speakers and transducers (piezoelectric or electromagnetic, depending on the size of device) that propagate microscopic 'bending waves' to deliver the sensation in exactly the right place – so it feels like it's under your finger.

They will be able to make a touch button on a phone or a microwave or a car dashboard feel like a physical button you're pressing or let you feel a scrollbar or scroll wheel you're dragging your finger over. Or you could get a sensation when you slide your finger over a key so you can get your hand in the right place, but not type anything until you press down firmly – like with a real physical button.

Haptic feedback is used in the Fitbit Flex to alert you to goals.

It doesn't have to be built into a screen either; you could get this kind of sensation on a wooden or metal surface, through the fabric of your car seat or even on a cardboard sign, as well as on glass or plastic. And it doesn't have to be in the same place each time, so you can rotate a tablet and still have a 'physical' home or Start button in the right place.

Doing away with physical buttons that move saves money (cutting the round hole in the glass of the iPad is expensive) and it saves a tiny bit of space (you could use that to put a bigger battery in or make the device smaller).

It also means there are fewer

MIXING YOUR METHODS

Gartner analyst Angela McIntyre says that being able to mix different methods of control when they make sense is important to the success of new interfaces: "Being able to do one thing with your hands, another with your voice and a third with touch. Well, it's the way we normally interact with people and things in our life. You could be typing in a document and say the name of a song you want to hear and have it start playing in the background as you're working."

parts to fail or break and fewer ways for water to get inside if you drop your gadget. James Lewis of Redux thinks we might see the first products incorporating this technology in as little as a year.

JUST USE YOUR PHONE

Gartner's Angela McIntyre thinks that several of these extra technologies will come to devices you already use. Your TV remote control might get accelerometers so you can gesture to change the channel as well as pressing a button to turn the volume down.

Hillcrest designed a remote control that looked like a giant bracelet called the Loop. It didn't take off when it was introduced a few years ago, but the company is in talks with several TV makers about adding it to high-end models. Samsung is including a remote with a trackpad for controlling its interface with some TVs this Christmas.

McIntyre's seen a lot of unusual ideas – from heads up displays in cars and screens that show one thing to the driver and a completely different image to the passenger sitting next to them, to shirts and gloves that give you the physical sensation of what's going on in the game you're playing to using galvanic skin response to turn different places on your arm into different buttons and controls. (Microsoft Research had a version of that, but you had to wear a Kinect on your shoulder to make it work.)

Some washing machine manufacturers are looking at using voice control to simplify complex features, but McIntyre thinks it makes more sense to use the smarts in something you already have.

"Why not us your smartphone as a controller?" It has touch, it has voice recognition, it has an accelerometer. "It is easier for that device to figure out what you're doing. You're close to it so it's not like having the thermostat on the other side of the room trying to figure out what is a gesture and what is you playing with your kids. For at least the next five years, I think the most convenient device people want to use as their controller will be their smartphones."

In other words, the new interfaces are probably already here. They're just waiting for us to start using them. ■

Accelerometers will start popping up in a lot more of your technology.

The humble TV remote is ripe for a revolution.

Hillcrest's Loop controller hasn't yet taken off, but it could be bundled with high-end TVs in future.

Samsung's new TV remote has a trackpad for you to control the onscreen interface.

Reader's letters

APC readers sound off on the latest tech issues.

It's likely the speedo in your car that's slow, not the GPS.

FAULTY GPS, OR FAULTY SPEEDO?

Firstly, as a reader of APC for over a decade I would like to say that I am continually impressed by your magazine and the writers and articles.

In the review of the TOMTOM GO 600 in the October 2013 issue, Goldie Hong makes mention that the GPS reads 3km/h under the car's speedometer. I have been using an old TOMTOM XL for many years and have found that in my wife's Toyota Echo, the car's speedometer is 1km/h under the GPS, while in my Falcon the car's speedometer reads 5km/h over the GPS. This is also the case with my smart phone. So I would suggest that it's the car's speedometer that is wrong, not the GPS.

I would like to make a further comment to Greg Keegan's letter about SSD drivers (see APC October, page 14). I was having a number of issues with my computer detecting, booting from and crashing on an OCZ Vertex 3 SSD. In desperation, I changed the SATA cable to a good quality one and the problems went away immediately. It's something to try as a first fix.

Thanks for a great magazine and keep up to good work.
Geoff Oliver

CLOUDS NEED POWER, TOO

I run a Netgear ReadyNAS Duo v2, which I've used as my own cloud storage while working interstate.

I learned the hard way to have both the NAS and ADSL modem on a UPS. Firstly, if you lose power, both will turn off and need to be manually turned back on - this can be problematic when you aren't home. Secondly, when the NAS is turned back on, it will trigger a resynch of the disk drives (assuming that they're RAIDed). This can take several hours, during which you will not have full NAS functionality. Thirdly, when the ADSL modem is rebooted, unless you have a static IP address (which is not normally the case with residential

Running a DIY cloud box isn't just about the NAS. One reader suggests a good UPS is a must-have.

ADSL) your ISP will dynamically assign a new IP address, which you'll need to know in order to access your files. A UPS won't stop this from happening if the power is out for several hours, although most power interruptions aren't that long.

I also noticed that the NAS hard drive review mentions WD Green drives as being RAID averse. They're on the Netgear NAS compatibility list and I've used them in RAID 1, but I wouldn't recommend them for NAS use. I don't know whether it's the head parking or the fact that they're a budget drive, but I've had two of them fail (fortunately I didn't lose any data) and I now use WD Red drives. They're more expensive, but the reliability is more important.
Bill Stomfay

A bad SATA cable could be at the root of SSD problems.

APCMAG@FUTURENET.COM

Come on, have your say!

We want to hear what you think. Add to these discussions or email your views (in fewer than 250 words) to **apcmag@futurenet.com**. All correspondence becomes the property of APC and is subject to editing. Letters must include full name, street address, suburb, state and phone number to be considered for print publication. Address and phone details will not be published.

A touchy subject

It doesn't take a forensics expert to figure out the new iPhone's fingerprint sensor is as susceptible to abuse as any other security mechanism.

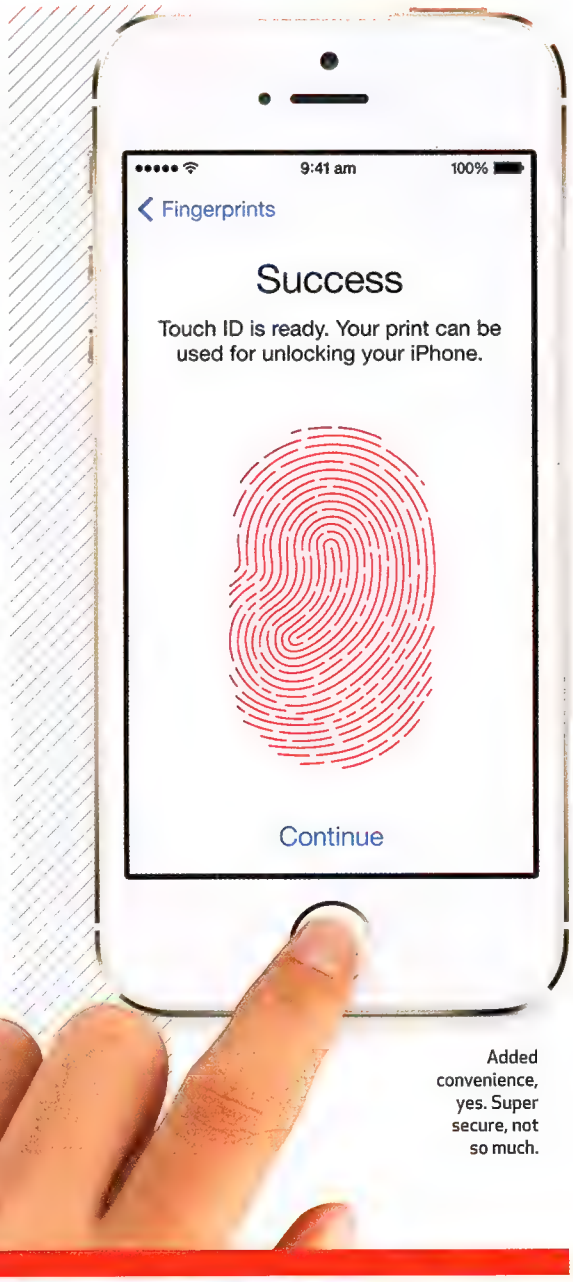
30 hours. In fact, a little bit less. That's how long it took German hacker 'Starbug' – of the Chaos Computer Club's 'biometrics hacking team' – to successfully bypass the iPhone 5s' much-publicised new Touch ID fingerprint security system with a fake fingerprint. The speedy achievement did not produce elation; in fact, quite the opposite. As he subsequently told *Ars Technica* in a post-hack interview: "I was very disappointed, as I hoped to hack on it for a week or two. There was no challenge at all; the attack was very straightforward and trivial."

Okay, let's rewind things a little. On September 10, less than two weeks before Starbug's disheartening breakthrough, Apple revealed its latest flagship smartphone to the world, the iPhone 5s. Alongside a faster processor and better camera, the 5s' most notable new feature was its inclusion of Touch ID, a fingerprint sensor housed in the smartphone's Home button, which enables users to unlock their device (and make Apple ID purchases) by simply pressing their finger against it. Months of leaks had ensured the fingerprint sensor wasn't much of a surprise when it arrived, but it was still a watershed moment of sorts. Fingerprint sensors are nothing new, but if anyone can boost this niche tech to the mainstream, it's Apple.

As soon as Touch ID was official, security concerns were voiced. After all, what if somebody got ahold of your fingerprint and was able to replicate it in some way, capable of falsely authenticating to (and unlocking) your device? It was some consolation when Apple clarified that users fingerprints weren't stored in the cloud or on Apple's servers – but rather in an encrypted non-image data format and only on the device itself. In reality, however, that's only a part of the problem. The fact is: people leave fingerprints everywhere, on virtually every kind of surface we touch, which is why fingerprinting is such an important forensic component of crime scene investigations.

But while Starbug was able to falsify authentication in under 30 hours, that doesn't mean Touch ID is an inherently flawed or risky feature. Why? As another successful hacker of the system – this time a white hat, Marc Rogers of security firm Lookout – has pointed out (**tinyurl.com/n26zeh8**), bypassing the system takes time, patience, specialist knowledge, the right equipment, plus an extremely precise, high-res and difficult-to-attain facsimile of the fingerprint.

Compared to the ease of someone observing you enter a four-digit passcode on your device, successfully getting past Touch ID is a Herculean effort. So unless you're the US president or CEO of a multinational company, sorry, but your fingerprint isn't worth it. And considering 50% of iPhone users don't bother implementing passcode security, the hullaballoo over the hack is mostly hot air. Which isn't to say users shouldn't be aware of it, but rather people should judge the merits of Apple's latest innovation from a balanced perspective.



Added convenience, yes. Super secure, not so much.

ENDUSER

Share the hilarity!

Do you work in the IT industry and are forced to deal with inept and clueless end users on a daily basis? Do you have an IT professional, who isn't that 'professional'? If you have an interesting or amusing story, email us at apcmag@futurenet.com. All correspondence becomes the property of APC and is subject to editing. Letters must include writer's full name, street address, suburb, state and phone number to be considered for print publication. Address and phone details will not be published.

technotes

» HOW IT'S DONE

1 Built from back to front there's a lot to remove before you can tinker with the screen.

2 The combined microSIM and microSDXC daughter board is mounted to the main motherboard (above right)

3 Precision is key when removing the tiny parts above.

4 The rear panel is simple to remove. A fingernail in the grove should see it easily pop off.

Samsung Galaxy S4

This month we crack open one of our Life Companions... well, one of Samsung's latest smartphones — the Galaxy S4 — at least.

BACKGROUND:

While the Galaxy S4 offers notable improvements in display, features, and processing power over its popular predecessor, the basic design is very similar, if not identical, to the Galaxy S III—which is a good thing, since that device is pretty fixable.

MAJOR TECH SPECS:

- 5-inch display with 1,920 x 1,080 resolution, at 441ppi
- 16-, 32-, or 64GB of internal storage, expandable with up to 64GB of external microSDXC storage
- 2GB RAM
- Qualcomm SoC with 1.9GHz quad-core processor
- 13MP rear-facing camera and 2MP front-facing camera
- Lithium-ion battery rated at 3.8V and 2600mAh (9.88Wh)

KEY FINDINGS:

- The back panel is easy to remove — a fingernail in the groove opens it to reveal the removable battery.
- The mid-frame is held into place by a few screws and a few clips that can be released with a plastic opening tool.
- With the midframe off, several connectors and a single screw are all that hold the motherboard in place. The front and backside of the motherboard hold all manner of chips, for communications, power management, memory, etc., as well as the 1.9GHz Snapdragon quad-core CPU.
- After removing the headphone jack, status LED, IR sensors, and 2MP camera from the front of the device, we're able to extract the remaining, slightly adhered parts filling the Galaxy S4's display assembly: a multi-purpose component that connects the earpiece speaker, IR blaster, and a sensor array; a linear oscillator vibration motor; and a daughterboard with a full-featured micro-USB port capable of HDMI output, connecting USB peripherals, and charging and transferring data.
- The display and front glass are fused with a layer of optical adhesive. The glass is then adhered to the plastic display frame, making a single assembly.
- Repairability score: 8 out of 10. The battery can be replaced in seconds, without any tools; easy access to internals — only 11 screws in the entire device, all standard Phillips #0; most smaller components are modular and can be replaced individually. You'll have to go through the entire phone in order to replace the front panel, since everything is built into the back of it. ■

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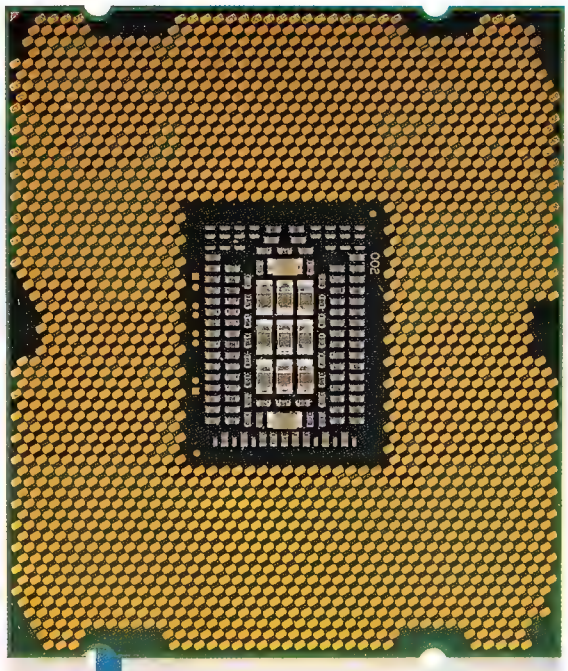

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INTEL CORE I7-4960X EXTREME EDITION

All hail the new desktop CPU king?

Here it is then: Intel's latest and greatest. An all new flagship PC processor. Its predecessor was already the fastest desktop CPU known to man. This thing will surely be even quicker. Hold on tight, it could be quite a ride! But hang on, what's this? Only six cores? Barely any faster clockspeeds than before?

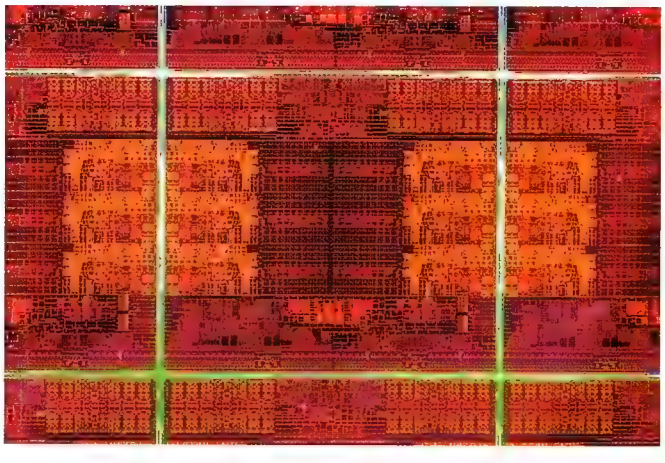
Let's not get ahead of ourselves. To understand the new Intel Core i7-4960X Extreme Edition, we need to trace the trajectory of both Intel processors and the PC industry over the last five years or so.

In really simple terms, Intel designs processor cores and the bits that go with processor cores separately. The cores are shared across several market segments: desktop, mobile, server — the usual. When it comes to what goes into the cores, all those different usage models enter the mix. You might argue mobile grabs most of Intel's attention these days, but features like virtualisation are present in all cores (even if they're not always enabled), and that has nothing to do with mainstream mobile computing.

However, take a look at the bits sitting around the cores and you'll find something very different. For starters, they vary. Where the cores are fundamentally shared, the non-core bits are built for a specific purpose. But there's a catch: that purpose can be mobile or it can be servers, but Intel doesn't make non-core CPU circuitry specifically for the desktop. The result is that there aren't really any true desktop CPUs.

All those LGA1150 desktop processors, including the new Haswell 4000 series models, are really mobile processors, and this new six-core beast is really a server chip. That explains why it has some pretty ridiculous features in the context of desktop computing, like a quad-channel memory controller.

More on those details in a moment. First we need to deal with the other half of the context surrounding the new 4960X, and that's the PC industry at large. Two factors are critical here. The first we've already touched on, and that's the increasing importance of mobility. The



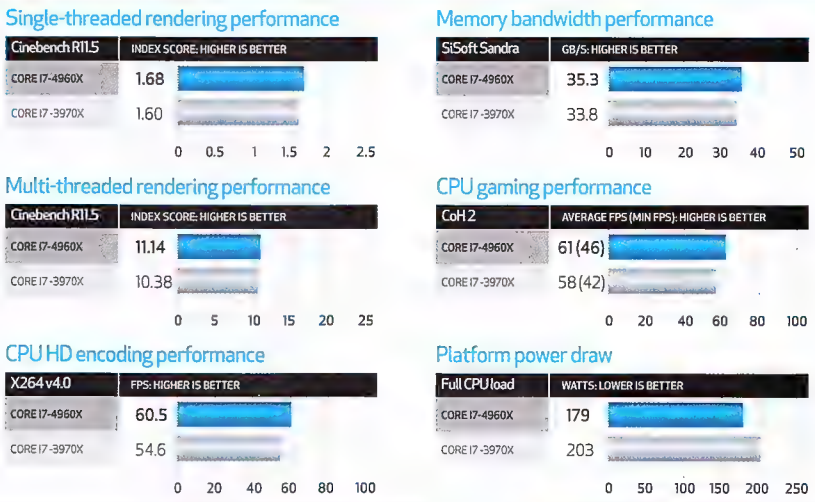
There are no hidden cores to be unlocked this time around.

LABS BENCHMARK RESULTS

Let's look at the new Intel Core i7-4960X Extreme Edition by the numbers. As you can see, it's barely any quicker clocked than the old 3970X. It has no more cores or cache, and the Ivy Bridge core is little changed over the older Sandy Bridge part (note that the 4970X doesn't get the latest Haswell core).

You might not expect a dramatic leap in performance — and you won't get one. Tweaks to the cores do unleash a reasonable 10 per cent boost in x264 HD video encoding, but elsewhere, the differences are negligible, with the possible exception of power consumption, which drops by over 20 watts. Not bad.

That aside, we wish there was something more exciting to report, but there simply isn't.



second is the inability of AMD to provide serious competition at the high-end over the past five or so years. Put all that together and the result is a near total absence of pressure on Intel to up its high-end desktop ante. Actually, it's worse than that — there's no pressure on Intel to make true desktop processors. So it doesn't bother.

NO MORE CORES

That, folks, is the context for the 4960X, and it will help us understand the specs of the new chip. So let's have a look. We're talking six cores in 22nm Ivy Bridge specification, so not the new Haswell architecture. Not that this really matters, because Haswell cores are fairly unexciting and their non-core bits are mainly of interest for mobile machines, but again, it reflects the server origins of this chip. Anyway, in traditional Intel style, each core supports two threads, so that's 12 threads or logical CPUs in total. Clockspeeds-wise, we're talking 3.6GHz nominal, 4GHz Turbo, so just 100MHz faster nominally and no faster at all in Turbo mode than the existing i7-3970X.

You get the same 15MB of Intel SmartCache, too. On the upside, the samey-samey spec means it drops straight into existing LGA2011 motherboards with the Intel X79 chipset. Well, it does assuming the availability of a BIOS update, which — ironically — Intel isn't providing for its own X79 boards. Yup, pretty outrageous. Intel's excuse is that it's pulling out of the motherboard market, but really it's too exasperating to comment on much further. A simple BIOS update for loyal customers with an Intel X79 is hardly too much to ask.

Performance claims are far from dramatic. Intel is mooting anything from five per cent to 10 per cent advantage over the old 3960X. Yes, 3960X, not 3970X. We can only assume the comparison was made with the 3960X to extend the gap from 'wafer thin' to 'fairly piffling'. Anyway, thus far we've painted a fairly underwhelming picture. What happens when you test this chip and compare it to the 3970X? Pretty much what you'd expect. In most benchmarks it's about five per cent faster. The one notable exception is x264 HD video encoding, which is around 10 per cent quicker on this chip.

SHRUNKEN

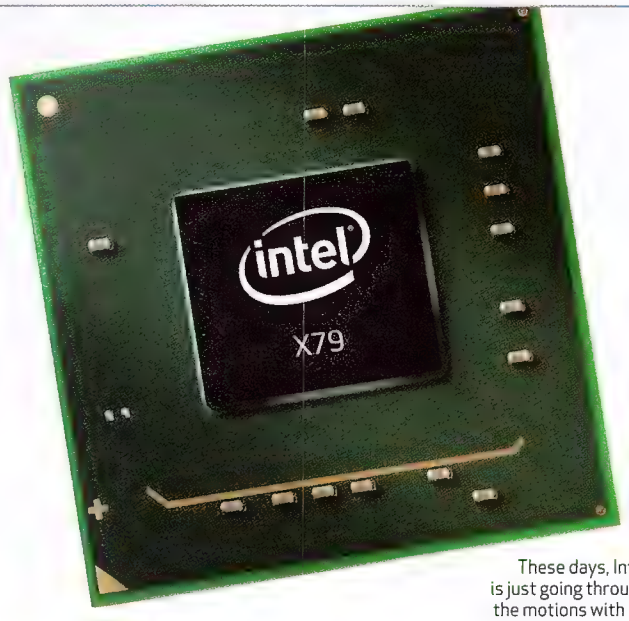
As for overclocking, we squeezed 4.6GHz out of the 4960X, which puts it just 100MHz faster than the 4.5GHz of our 3970X sample. That's disappointing given that the 4960X is based on the 22nm lithography to the 3970X's 32nm, but when the standard Ivy Bridge chips failed to offer much over the Sandy Bridge variants, it's not a huge surprise.

One area where the 4960X's process shrink pays off is power consumption which drops by a little over 20 watts. That's in line with the official specs, which have dropped from 150W to 130W.

All of which means Intel's latest is better by every metric, but by a margin that makes no difference in the real world. If you already have a 3960X or 3970X, the 4960X has nothing to offer you.

That leaves one question. How good could this chip be if Intel made an effort? With the previous generation, it was hard to ignore the fact that the CPU die had two hidden cores that were switched off. Going by the die shot of the new 4960X, that's no longer the case. It's a true six-core die.

On the other hand, Intel is making eight, 10 and even 12 core chips based on the same Ivy Bridge-E architecture under the Xeon brand. Any and all of those could — and we think should — be offered as desktop processors. Then we'd have something to get excited about. As it is, the new Core i7-4960X is disappointing on nearly every level. That's becoming a familiar refrain with Intel's high end offerings. The really depressing bit is that it could so easily remedy the situation, but it doesn't need to. **Jeremy Laird**



These days, Intel is just going through the motions with its desktop processors.

Verdict

Features ★★★★★
Performance ★★★★★
Value ★★★★★

A very small, incremental step, and final, disappointing proof that Intel is now sandbagging on an epic scale.

ALL-IN-ONE

$2,300 | WWW.ASUS.COM.AU

ASUS ET2702IGTH

Beauty on the outside, beast on the inside

Up until now, most all-in-ones haven't truly earned that "all" moniker, due to their sacrifice of power or functionality in favour of a more compact size. ASUS hopes to buck that trend with its ET2702IGTH. Not only does it have a 27-inch screen — large enough to replace many bedroom TVs — but there's an optional TV tuner, supports HDMI in/out, and has enough horsepower for your basic gaming and computing needs.

Its most striking feature is its beautiful edge-to-edge, glossy, 2,560 x 1,440 IPS display, which offers an impressive 178-degree viewing angle and vibrant colours. The ET2702 has the required 10-point touch — although, like most, it has a hint of input lag. Although it can't bend back flat, the 25-degree tilt range is enough for most uses. The ET2702 is also VESA-mount compatible, though the mount is sold separately.

Spec-wise, the ET2702 has a lot going for it. It has 8GB of DDR3 RAM, a 2TB HDD, and plenty of inputs, including four USB 3.0 ports, two USB 2.0 ports, an SD card reader slot, mic/headphone inputs, an Ethernet jack, and a Blu-ray combo drive. The brains of the operation is Intel's new Core i7-4770 quad-core Haswell CPU clocked at 3.4GHz. Also included is an AMD HD8890A discrete graphics card.

All around, the ET2702's impressive specs make it the most powerful all-in-one we've tested to date. Its Haswell CPU clobbered its predecessor's Ivy Bridge by roughly 30% in both Stitch.Efx 2.0 and x264 HD benchmarks. Its least impressive gain was a 7 percent win in our ProShow Producer test. The ET2702's HD8890A video card is equipped with 2GB of DDR5 and performed a staggering 200 percent better in 3DMark 11 than that older model's GeForce GT 630M. In our *Metro 2033* test, it performed 77 percent better — that's the difference between a playable game and a slideshow.

We don't normally test all-in-ones with graphically intense games because, frankly, they haven't been powerful enough; but considering that the ET2702 uses a new beefy video card, we figured we'd boot *Far Cry 3* to give it a real-world workout. Initially, the ET2702 struggled on medium settings at its ridiculously high 2,560 x 1,440 native res, producing an average frame rate in the high 20s, but when lowered to 1,920 x 1,080, the frame rate jumped to the high 40s. While not exactly mind-blowing, it's impressive for an all-in-one.

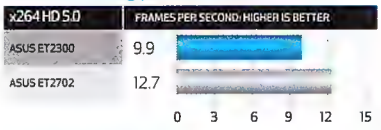
On the audio side, it features four 3-watt speakers built in below the monitor. They handled surround audio well and offered plenty of volume firepower. There's also a separate subwoofer available for a fee.

The included accessories are a bit of a mixed bag. On the upside, the wireless keyboard uses black chiclet keys that not only match the look of the ET2702 but are also easy to type on, and the entire thing has a nice weight to it. We were less impressed with the mouse, which eschews the middle mouse scroll wheel in favour of a weird trackpad-esque button which reduces responsiveness.

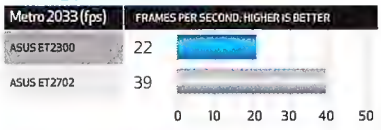
Perhaps the ET2702's biggest hurdle, however, is price. If you can get over its $2,300 price tag and are looking for a PC that doesn't take up much space, offers good power, and has a beautiful screen, then this one's for you. ■ Jimmy Thang

LABS BENCHMARK RESULTS

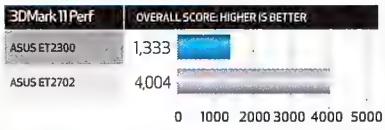
Video encoding performance



Gaming performance



Gaming performance



ABOVE WE'VE COMPARED THE ASUS ET2702 TO ITS OLDER ET2300 SIBLING. THE LATTER HAS A 3.0GHZ INTEL CORE I5-3330M, 8GB DDR3/1600, 1TB 7,200RPM HARD DRIVE, A GEFORCE GT 630M, AND WINDOWS 8. *METRO 2033* WAS TESTED AT 1,280 X 768-PIXELS WITH MEDIUM SETTINGS, TESSELLATION ENABLED.

Verdict

Features	★★★★★
Performance	★★★★★
Value	★★★★½

A beautiful IPS display with an impressive native resolution and viewing angle along with the power inside to drive it.

★★★★½

apc RECOMMENDS

BAREBONES PC

$799 | WWW.ASROCK.COM

ASROCK M8

What does a mobo maker know about PC building?

Spun off from ASUS over a decade ago, ASRock is a company that's recently started to move away from the mid-range/value customers that have been its bread and butter for so long. Most will recognise the company's motherboards, which ASRock claims are the third most popular brand in Australia, but it turns out its also been making small form factor PCs for a while too. The new M8 is quite unlike the plain, simple SFF boxes of ASRock's past however; designed by the ultra-stylists at BMW's DesignworksUSA, it's obviously a product to kick off ASRock's quest for those with stacked wallets.

This isn't just a case – it's a fully-fledged barebones PC. Inside the chassis is a 450W power supply and mini-ITX motherboard, along with a slot loading optical drive, 802.11ac Wi-Fi and a special monitoring screen on the front of the case. All you need to bring to the party is a Socket 1150 CPU with slimline cooler, two sticks of memory, a hard drive or two, and a graphics card. Seen in this light, the street price of around $725 isn't quite as unreasonable as it first appears, though it's still not exactly in the two minute noodle range of pricing.

Measuring just 372 x 123 x 400mm, the M8 will easily slide into a bay on your AV rack. It can also be mounted vertically, and doing so rotates the front LCD display so that the text is still readable. The small case is certainly a stunner, though we'd have liked to see a version without the large Perspex windows. It's made from extremely rugged steel and aluminium, with a minimum of plastic apart from the windows. Portable gamers will appreciate the built-in handles, which can be attached to a shoulder strap.

Heading inside the tightly packed case we see the tiny mini-ITX motherboard that makes the M8 possible. Despite its tiny dimensions of around 120 x 120mm, this board packs the full power of the Z87 chipset, and supports a healthy range of overclocking options. Unfortunately there's not a lot of room for a CPU cooler, which could prove to be the limiting factor for tweakers.

The motherboard comes with six SATA 6Gbps ports, but there's only room for one mechanical drive, plus an SSD. If you can afford to go all SSD, there's room for a total of five. The memory slots are very interesting, using the SODIMM format found in laptops to keep the size down, and supporting a top speed of 1600MHz. We were very happy about the inclusion of Creative's Sound Core 3D audio codec – one of the best integrated audio solutions on the market.

A special riser card allows the installation of a single full length graphics card, including NVIDIA's new GTX 780 or Titan. Combine this with the Socket 1150 CPU, and this machine could easily pack the punch of a heavyweight. Unfortunately, it'll sound like a blizzard with such powerful hardware, as the four small 70mm cooling fans won't be up to the task. However, stock it with slightly less ridiculous hardware and the M8 will make a wonderful gaming or multimedia box, all wrapped up in the convenience of a very small, portable package. Just be prepared to pay a little extra for a PC so unique, as well as a rather challenging, claustrophobic build.

Bennett Ring

Verdict

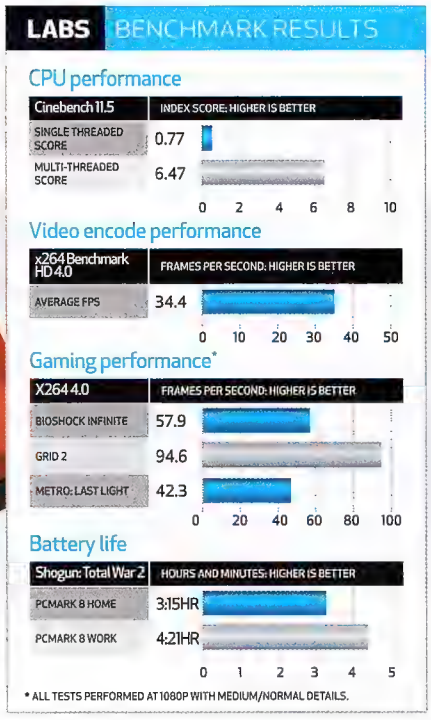
Features	★★★★★
Performance	★★★★½
Value	★★★½☆

If this is what ASRock can create with a higher budget, we can't wait to see what else they come up with.

★★★★½

GAMING LAPTOP

$1,899 | WWW.GIGABYTE.COM.AU



GIGABYTE P27K

Orange may be the new black, but we think we prefer black.

Gaming laptops are known for not being particularly subtle beasts when it comes to visual style, and though Gigabyte's new 17-inch P27K doesn't quite go overboard in that department, when closed its vaguely-pearlescent orange lid does somewhat scream "not a standard laptop". The world already has its fair share of big, beefy and loud gaming laptops, so what does this one offer that others don't? In a word: control.

The P27K packs a hardware button above the keyboard (on the top right) that lets you switch between the laptop's integrated (Intel HD Graphics 4600) and discrete (Nvidia GeForce GTX 765M) graphics, lighting up green or orange respectively to let you know at a glance which mode you're using. Now, graphics switching on its own isn't a particularly unique feature – most laptops with discrete GPUs do this automatically in the backgroud and also offer some control through the graphics driver software over what runs when. By default however, it's left entirely up to the system as to when the discrete GPU is enabled. The main advantage with the P27K, then, is in convenience and being able to decide exactly when you want to save power vs gain performance.

POWER SAVER

Being able to easily switch between the two graphics chips does definitely offer advantages, too. Battery life, for example, leapt from 3:14hr to 4:21hr in PCMark 8's Work test just by toggling that switch – and an extra hour of battery life in a notebook this large is nothing to sneeze at. Especially one with decently high-end specs like the P27K's; inside there's a quad-core Intel Core i7-4700MQ CPU, 16GB of RAM, a 256GB SSD for the Windows 8 OS (and your apps/games) plus a 1TB traditional hard drive for less-critical storage. There's no touch-screen, but the matte-finish on this 1080p number does mean games look great and there are no reflections to get in the way of enjoying the visuals.

PLUG IT IN

There's a bevy of expansion ports too: HDMI, VGA, three USB 3.0s (one of which doubles as an eSATA port) and one USB 2.0, a flash card reader, Gigabit Ethernet, TOSLink audio output (so you can plug it into a surround-sound system) and a Blu-ray reader.

In fact, our only major usability gripe is that the trackpad could perhaps be bigger – considering how physically large the P27K is, it's on the anaemic side. That trackpad also had a habit of annoyingly opening up the Windows 8 Charms bar when we got anywhere near its far right side, even when we were a centimetre or more away from the edge. And as is typical of these bigger laptops, its weight of 3.14kg (sans charger) means you won't want to be lugging it around too much. Although at least with a 4-hour-plus battery life when it comes to basic work tasks, it can last a good while when you do need to.

Now Gigabyte, perhaps we ought to have a word about that naff orange lid... **Dan Gardiner**

Verdict

Features	★★★★½
Performance	★★★★½
Value	★★★½

It's big, beefy and powerful, certainly, but this gaming laptop can also go the distance when called for.

★★★★½

GRAPHICS CARD

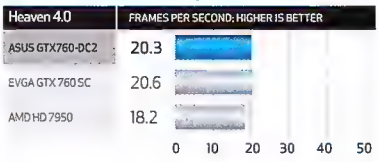
$339 | WWW.ASUS.COM/AU

apc RECOMMENDS

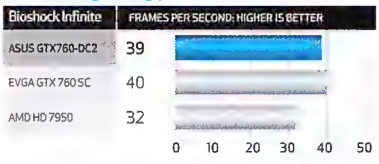
LABS BENCHMARK RESULTS

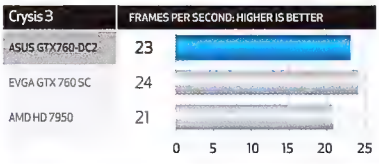
EVGA's slightly higher overclocked 760 gets you an almost imperceptible performance boost for the extra money you're spending on it. The ASUS card, however, is smaller, cheaper and a couple degrees cooler under fully-loaded operation. Both cards show up the more expensive Radeon 7950 in pretty much every benchmark we ran.

DirectX 11 tessellation performance



DirectX 11 gaming performance





ASUS GTX760-DC2OC

Cooler, smaller, quicker. That's pretty much the GPU trifecta, right?

Back when men where real men, women were real women and small, furry creatures from Alpha Centauri were real small, furry creatures from Alpha Centauri, we reviewed ASUS's miniature take on the GTX 670. It was the first of the cards based on that GPU to take advantage of the shortened PCB of the reference edition, and despite its crazy price premium it was a decent little card.

Why, by Odin's beard, would I be talking about such things when this here GTX 760 is plainly not so mini? Well, they do both share a good deal of the same silicon DNA, but thankfully not the same pricing. The standard GTX 760 has breathed life into Nvidia's mid-range GPU stack, offering unprecedented gaming performance levels at the $300-ish price point. For the most part this newer card is at least on par with the nigh-on $400 GTX 670, but more importantly for Nvidia is the fact that it's quicker than the competing Radeon HD 7950.

The combination of outperforming and ultimately undercutting the opposition has put the GTX 760 on the map, and we checked out EVGA's Superclocked card in our labs previously. This more diminutive version from ASUS is still overclocked, and is perhaps an even more tantalising product.

GENE SPLICING

So yeah, that silicon DNA. Like the GTX 670 Mini, ASUS's GTX 760 is running with the cut-down PCB of the reference card, but instead of hobbling the cooling solution, it's given it the full DirectCU II treatment. That does mean the heatsink sticks out the back of the PCB a touch, but actually that just adds a little GTi flavour to the mix. It's a bit longer too, but will still happily fit inside many mini-ITX cases.

It's got a decent overclock too, boosted up over the 1GHz mark from a base of 980MHz. However, thanks to the new implementation of GPU Boost 2.0, it's rare that you'll find the clocks going that low in-game. I was seeing the GK104 GPU prancing along at 1,163MHz, and a good chunk of that extra clockspeed can be traced to the impressive Direct CU II cooling array. It manages to drop the 100% loaded temperature of the chip down to 69°C from the 81°C of the reference card. That's a couple degrees cooler than the new ACX cooler that EVGA used for its Superclocked GTX 760.

In actual performance terms though, little has changed. The fact that the high clockspeed barely translates into any actual fps performance gains is indicative of a second round of cards based on the same silicon. This GK104 is running at its limits in terms of the geometry it can toss about, so neither overclocked card is really worth it for any perceived improvements in overall performance.

But when the card is already performing this well that's not such a problem – and as ASUS's card is only a little over the RRP you're simply getting a smaller card with a much more impressive cooling array in return.

In fact, the DirectCU II cooler is noticeably quieter in operation, too. Even if space isn't at a premium, this smaller GTX 760 still gets the nod from us. ■ **Dave James**

Verdict

Features	★★★★½
Performance	★★★★½
Value	★★★★½

ASUS has nailed the GTX 760 form factor with an impressive cooling array and a rather tasty price tag to match.

★★★★½

BUDGET MOTHERBOARD

$169 | WWW.GIGABYTE.COM.AU

GIGABYTE GA-Z87-D3HP

Cheaper very rarely means better.

There's one in every group. One that has you tearing your hair out. If you have a lot of hair, which at least one member of the *APC* team does not. We'll say no more on that.

The hair, that is, not this rather infuriating Gigabyte board, which at this stage we're obliged to discuss even if we'd rather forget it. From the moment the deboxing began, it didn't bode well.

For starters, the PCB is thin, flimsy and generally devoid of proper heft. Gigabyte doesn't quote how many layers the GA-Z87-D3HP's PCB has, but it's still seriously skinny.

Anyway, the point is that the general air is of a board that's had dollars shaved of the production cost whenever possible. That includes not only the thickness of the PCB and the number of copper layers, but also its width.

It's one of those less-than-full-ATX size boards. Specifically it's 16mm narrower than the full ATX standard.

SLIM PICKINGS

Does any of this matter? Actually, yes. The narrower board spec means you can't use all the ATX mounting points. Combine that with flimsiness and the result is a fairly alarming amount of bend when hooking up certain components. It doesn't exactly scream long-term reliability.

Then there's performance. At stock clocks, the numbers are on the mediocre side of uninspiring. Typically, the issue is implementation to Intel's Turbo mode. Some boards push the limits a little more than others. The Z87-D3HP is pretty conservative.

In reality, the gap to the fastest Z87 boards in most benchmarks is pretty academic; 8.06 points in Cinebench versus 8.5 for the best isn't the kind of difference you can feel. That said, the 34.5 frames per second it kicks out in *Shogun: Total War 2* looks pretty squiffy when others are achieving nearer 40.

You can, of course, get round some of that courtesy of some hand-tuned overclocking. Indeed, you get a full range of overclocking options in the BIOS, including quick-jump settings to various pre-baked overclocked levels right up to 4.7GHz with our Intel Core i7-4770K test chip. In fact, you get essentially the same snazzy BIOS with HD res support that comes with Gigabyte's premium-priced boards, for what that's worth.

Anyway, the real bummer is that the GA-Z87-D3HP does that old trick of booting at that higher speed but then throttling down much lower as soon as you give it something to ponder. The same goes for hand-tuned overclocking. It boots successfully at 4.7GHz, which is up there with the best, but give it some multi-threaded number crunching to think about and the clocks drop to 4GHz. Not good.

Of course, you have to set the flimsy cheapness, relatively mediocre performance and slightly borked overclocking against the circa $169 price tag. That's aggressive for a Z87 board, but in this case it's also a bit of a false economy.

The reason to go with a Z87 board is to ensure access to the best possible performance. If it's not giving you that, then what exactly is the point?

Jeremy Laird

Verdict

Features	★★★½☆
Performance	★★½☆☆
Value	★★½☆☆

A premium chipset for a knock-down price is tempting, especially from Gigabyte, but this board is a false economy.

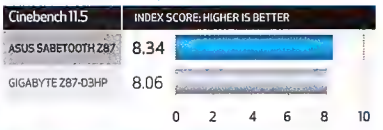
apc RECOMMENDS

HIGH-END MOTHERBOARD

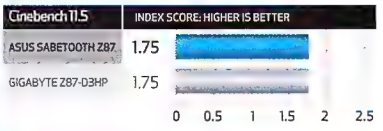
$330 | WWW.ASUS.COM/AU

LABS BENCHMARK RESULTS

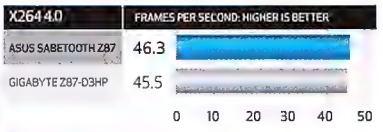
Multi-thread CPU performance



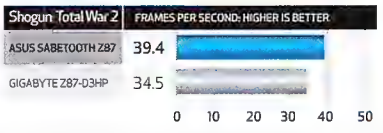
Single-thread CPU performance



Video encode performance



Gaming performance



ASUS SABERTOOTH Z87

No fancy bits, but still a good — affordable — performer.

This will have engineers at ASUS's competitors either headbutting their workbenches in frustration or pacing up and down their labs like neglected zoo animals, because it's going to really hurt.

We're suckers for the new Sabertooth Z87 just as much as we were for its Z77 daddy.

In some ways, the Sabertooth is nothing special. For the cynical, the recipe goes something like this. Take a plain Jane motherboard. Cover it up with some bits of pointless plastic. And then flog it at a bit of a premium price point. Kerching, indeed.

And there's a lot of truth in that position. The board that underpins the Sabertooth isn't a fancy-pants high-end item, and it is clad in frankly fairly cheap plastic panels. Premium features like a debug LED readout, hardware power buttons, V-check points? HA! Fuggedabowdit, you get none of that stuff, but here's the thing: the end result is greater than the sum of its parts.

PRACTICAL CONCERNS

Let's kick off with that cladding. It does actually serve a purpose: keeping dust off the board and out of unused ports and slots. Then there's the metal brace on the rear that keeps the board flat and trim. Both are genuine boons if you plan to keep and run a board for the long term, making it that little bit more likely that it'll keep on trucking.

ASUS claims it helps to keep components cooler by better managing airflow. The metal brace also has thermal pads so it acts as a large heat sink. Want to know how effective all that is? As it happens, ASUS bundles an app called Thermal Radar along with nine hardwire temp sensors and a further three probes for preferential positioning so you can find out.

Then there's the BIOS. ASUS's UEFI BIOS is one of our favourites. It's clear, it's easy to navigate, and it's not excessively gimmicky. The labels and names ASUS uses are familiar and make sense, and it offers all the options we realistically want.

It's hard to argue with the performance numbers that the Sabertooth cranks out, too. It's not the fastest Z87 board we've ever tested, but it's close enough for that not to matter. Moreover, it's second only to the almost dubiously fast MSI Z87-GD43 for gaming. The question is how much you care whether your board cranks out 8.3-something points in Cinebench or 8.5.

More importantly, it's right on the pace for overclocking, knocking up an easy 4.7GHz with our Intel Core i7-4770K test chip. Would the likes of MSI's GD43 yield a slightly higher maximum frequency courtesy of extensive hand tuning by somebody who really knows their overclocking oats? Very likely. If that's you, the MSI is probably the better choice.

But for everyone else, the Sabertooth offers quick, painless overclocking that anyone will be able to achieve.

All of which brings us to the one and only significant issue we have with the Sabertooth Z87: its pricing. Sure, the $330 sticker means it's much cheaper than a true enthusiast-class motherboard — they go for $400-plus — but it still feels like a lot for what is, ultimately, a jazzed up mainstream board.

Jeremy Laird

Verdict

Features ★★★★½
Performance ★★★★½
Value ★★★½☆

If the Sabertooth was available for under $300, it would be a no-brainer, but even for $330, it's still awfully wantable.

★★★★½

NAS STORAGE

$900 | WWW.IOSAFE.COM.AU

IOSAFE N2 NAS RAID

A disaster-proof NAS designed for the apocalypse.

Back in 2011, we took a look at the ioSafe SoloPro USB Backup Drive, which offered a lone SATA hard drive wrapped in a bombproof skeleton of steel, ceramic, and plastic. That drive won an Editor's Choice award for its ability to withstand both fire and water, which is the typical outcome when a house is engulfed in flames then doused by the local fire brigade.

IoSafe recently released a new drive with even more protection, the N2 NAS RAID, which, as its name implies, is two drives in a redundant array in a NAS box. This top-shelf storage device runs a Synology OS and comes with one year of "no questions asked" data recovery service, so you're covered if you drop the NAS or your kid drops an ice-cream cone into it. This level of protection doesn't come cheap though, with the N2 selling as a "disk-less" shell for $999, with two 2TB drives for $1,399 and 8TB for $2,499 (along with several other variations). It includes a one-year hardware warranty and one year of data-recovery service, so even if both hard drives are damaged, ioSafe will pay up to $20,000 to recover your data.

For all your hard-earned, you receive the N2's ability to withstand up to 843 degrees Celcius (or 1,550 F) for 30 minutes and up to 72 hours submerged in as much as 10 feet of water. The ioSafe N2 can be set up as a "data safe," in that it can be secured with a Kensington lock or bolted to the floor using holes located at the bottom of the drive.

The rear of the N2 features a Gigabit Ethernet port and two USB 3.0 ports for adding more storage to your network, or for a print server. The front of the case features a USB 2.0 port, SD card reader, and a copy button that allows you to copy all the contents of an SD card or USB drive to the N2 — a great feature that lets you make a quick backup without a PC. IoSafe's N2 is based on Synology's NAS server platform, which features a slick user interface with logical menus and an expansive software collection. Even better, no software needs to be installed in order to access the unit from any web browser to configure the drive and run applications. The software lets you run a range of utilities to stream media, download torrents, host your own web server, and a lot more.

The N2 we reviewed came with two 1TB 7,200rpm Seagate Barracuda drives, and on our office network the N2 displayed decent read speeds of 62MB/s and write speeds of 71MB/s, which is a bit slower than USB 3.0 but not too shabby. To test its fireproof and waterproof claims, we placed the N2 in a BBQ pit, then after 22 minutes, we completely submerged the NAS in a bucket of water. When we eventually removed the hard drives from the case they were completely dry and unaffected. To recover data from the ioSafe N2 with a PC, we needed to boot into Ubuntu (from a Live USB key) and follow a tutorial from the Synology FAQ, which was a lot of work and a lot more tedious than we would have liked, but it worked fine and our data was recovered.

The ioSafe N2 NAS RAID certainly kicks arse. It's literally the surest way to keep local data safe that we have ever seen. We just wish the data recovery process were a bit easier. ■ Julian Reiche

Verdict

Features	★★★★★
Performance	★★★★½
Value	★★★★½

A premium fireproof and waterproof recovery option to keep all of your data protected.

★★★★½

apc HOT PRODUCT

NAS HARD DRIVE

$240 | WWW.SEAGATE.COM

SEAGATE NAS HDD 4TB

Seagate sees Red… and overtakes it.

WD's Red series of NAS drives are popular amongst prosumer NAS owners. They're not the only drives intended to live in NAS devices though, with the somewhat unimaginatively titled Seagate NAS HDD taking on the same segment.

We reviewed the largest drive in the range, a 4TB behemoth, but it also ships in 2TB and 3TB capacities. SATA 6Gbps is now standard for hard drives, and the NAS HDD is no exception. The inclusion of TLER (Time Limited Error Recovery) is unique to NAS drives, and ensures a NAS device stocked with several of these drives doesn't get hung up while in RAID mode. It's not specific to Seagate though, WD uses the same technology.

A 64MB cache is standard across all capacities, while the 4TB model comes packing four platters. A three year warranty is relatively healthy for hard drives.

To test performance we used the same rig as we did for last month's NAS drive roundup (see *APC* October, page 41), and were pleasantly surprised at the results. We also used the same benchmarks, real world file copies that tested both sequential and smaller file performance. The results were almost universally in Seagate's favour; it only lost out to the Red in a single test. Seagate drive saw a large performance increase in sequential read performance of over 50% and smaller file reads were also faster, by 25%.

Considering both drives are identically priced (with the Seagate actually around $10 cheaper in many stores), we have to proclaim the NAS HDD as our new favourite choice for SOHO NAS owners.

Bennett Ring

Verdict

Considerably faster than Western Digital's Red series when it comes to read performance, Seagate's NAS HDD is the best SOHO NAS drive we've tested.

apc RECOMMENDS

EXTERNAL HARD DRIVE

$210 | WWW.CORSAIR.COM

CORSAIR VOYAGER AIR

Add an extra 1TB of storage to your iPad, with a portable Wi-Fi drive

Corsair Voyager Air is a 1TB external hard drive (500GB units are also available) that can connect to your iOS or Android device over Wi-Fi, letting you watch video, view photos and open other files stored on it, leaving the storage on your device free for apps and games. There's a USB 3.0 port for loading the drive with files from your computer, and it can be plugged into your home network using its Ethernet port, making it behave like a network storage drive.

It's most useful on the go though, thanks to its built-in battery and the ability to create its own Wi-Fi hotspot. To access the Voyager Air from your smartphone or tablet, just download the accompanying app, which automatically detects the unit and connects. It comes with both a mains and a car charger too.

We tested with an iPad and connecting to the drive was simple. There's no media sorting (letting you just view videos, say), or even a search function, so you need to make sure you organise everything into tidy, clearly named folders. All the movies we tried (including high-quality 1080p videos) played smoothly. Photos looked good, but the app struggled with rotation. For files that aren't supported by iOS, you can use the 'Open With' option to send them to a capable app.

There are some features missing: internet sharing over Ethernet (it can do this over Wi-Fi) and remote access most prominently, though the latter is planned in an update. But for the most part, it's the most capable external storage for mobiles we've seen yet.

Matthew Bolton

Verdict

A sleek and massively useful way to take a library of HD films with you to play on your smartphone or tablet.

ASUS

ADVERTISING FEATURE

GET THE MOST BANG FOR YOUR PC BUCK

Extract the full potential of your system with ASUS 4-Way Optimization.

Intel's latest 4th-generation Core platform already has some quite aggressive power and performance optimisations, but ASUS has taken those a step further by building its own optimisation features into its new Z87-chipset motherboards – and they do much more than just automated overclocking.

Of course, if you do want to squeeze every last ounce of performance out of your desktop rig, ASUS's 4-Way Optimization process does make the whole thing dead simple. At the other end of the spectrum though, it can also help reduce the power consumption of your PC when that workload isn't as demanding, or even make it run more quietly by adjusting the speed of all the fans under the chassis.

WHAT YOU'LL NEED

- An Intel 4th-generation Core PC built using an ASUS Z87 motherboard
- CPU and case fans with three- or four-pin connectors
- Windows 7 or 8
- Official ASUS motherboard drivers installed
- ASUS AI Suite 3 software featuring 4-Way Optimization

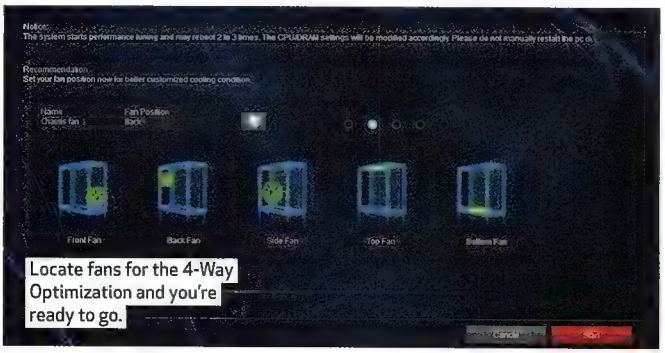
HOW IT WORKS

Taking advantage of 4-Way Optimization is as easy as firing up AI Suite 3 in Windows and then clicking the '4-Way Optimization' button. This will reboot your machine and then perform a series of four tests, each designed to establish the most suitable settings for different areas of your specific PC's hardware.

GO FASTER

The first of those is to see how far your particular CPU, cooler and motherboard can be pushed in terms of overclocking. Because every chip and cooler combination can be different, the highest safe speed that a CPU can be pushed also varies quite a bit. The 4-Way Optimization test gradually ramps your processor up in small increments, running CPU stress tests at each step, until it reaches one of several thresholds – system instability or a thermal limit

AI Suite's main interface gives you a quick overview of your whole system.



Locate fans for the 4-Way Optimization and you're ready to go.

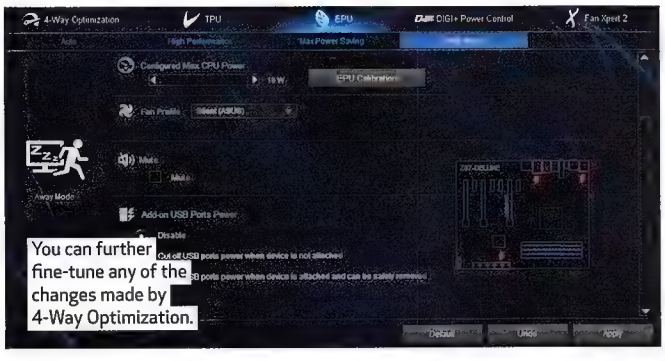
FULL MANUAL

If after running 4-Way Optimization you do want to go further than what those automatically tuned settings provide, ASUS's AI Suite 3 also gives you the freedom to dig in and customise your entire configuration manually. That includes things like manually adjusting the fans so they're quieter (great if you want to quieten down the internal fans in a home-theatre PC) or even set the CPU's upper TDP limit — which means it'll draw less power… though that'll obviously come at a cost to performance.

based on your CPU model, for example, with the CPU core voltage limit of 1.275v. This allows the optimizer to not only discover the fastest possible frequency for your PC, but also the one that offers the most stability. It ensures the whole process is safe, too; even the dreaded blue-screen of death barely slows down that optimisation process — the optimizer's designed to take it into account, and will continue optimising after the PC's booted back up.

POWER EFFICIENCY

The second test uses ASUS's Energy Processing Unit (EPU) chip to test how much power is being used in different usage scenarios (while overclocked or while idle, for example) and then uses the results to let it dynamically adjust how much power is consumed by different components in different circumstances. This saves power, particularly when the system is only under light use or is sitting idle.



KEEPING THE FANS HAPPY

For the third test, 4-Way Optimization individually tests each of the cooling fans in your system, adjusting voltage and measuring the resulting fan speeds. As with the earlier overclocking stage, the cooling fans used in a PC can vary from system to system, so this allows the optimizer to create profiles for each one of the individual fans in your system, allowing for much more fine-tuned and efficient overall control. Fans can be one of the noisiest components in a PC, so spinning them slower or faster can have a large impact on system acoustics.

POWER TUNING FINAL TOUCHES

The last stage of the optimisation procedure is to measure how much power is required by the memory and CPU (which is managed via the DIGI+ VRM power system) under different situations. Based on those findings, ASUS's optimizer applies further fine-tuning that ensures these components use the least amount of power required under all circumstances.

THE END RESULT

After 4-Way Optimization is complete, you'll be presented with a report summarising all the changes that the process has been made to your system. What you should find is that your system hasn't just been overclocked — instead, it's been both optimised and fine-tuned across the system. It's all been done automatically, without you having to know the specifics and intricacies of temperature and voltage limits of Intel's 4th-gen Core platform.

ASUS®

apc RECOMMENDS

DOCK

$320 | WWW.BELKIN.COM.AU

BELKIN THUNDERBOLT EXPRESS DOCK

Add extra ports to your Thunderbolt-equipped Mac.

This device adds a selection of extra ports to Thunderbolt-equipped Macs and while it costs a lot, it can really bulk out a MacBook for desktop duties.

It has three USB 3.0 ports, though they're capped at 2.5Gbps. That's not a problem with hard drives since they operate well below this ceiling – our test drive worked as well through the dock as with a modern Mac – but you won't get the most out of high-performance SSDs. Our test SSD reads sequentially in excess of 400MB/s when connected to a Mac. It failed to surpass 200MB/s through the dock, averaging 170MB/s. Random read speeds averaged just under 100MB/s. While better than USB 2.0, it's a disappointing drop from 170MB/s with a Mac with USB 3.0 built in.

The dock also provides FireWire 800, Gigabit Ethernet along with audio input and output mini-jacks, all on the back side.

A channel on the dock's underside routes a cable along the front which is then held in place, allowing portable storage to be quickly connected.

Sheer convenience goes some way to justifying the expense if you'll use the dock with a MacBook. You only have to connect one cable when you return to your desk in order to use speakers, storage and other devices left attached to the dock. That includes an extra display, if you use a Mini DisplayPort to attach one to a Thunderbolt port.

As for Thunderbolt cables, Apple sells one that's 0.5m long ($35), which is a more affordable choice than longer alternatives.

Alan Stonebridge

Verdict

A great dock with some terrific extra features, but lacks the perfection we like to see at this price.

GAME CAPTURE UNIT

$170 | WWW.AVERMEDIA.COM

AVERMEDIA C875 LIVE GAMER PORTABLE

Share your virtual blaze of glory, anywhere, anytime.

The online streaming of video gameplay is up there with Twitter and Instagram as popular phenomena of the digital age that nobody could have predicted.

Sites like Justin.TV and Twitch are filled with thousands of live streams showing gamers playing their games, and they're visited by tens of millions of users each month. And capturing that game footage just got a whole lot easier with the C875 Live Gamer Portable.

The beauty of this little box is that you don't need to plug it into a computer to capture footage. It'll jack into any PlayStation 3, Xbox 360 or PC and record on the spot. In standalone mode it can only record in 720p at 60fps, but this lower resolution is offset by how simple it is to set up and begin capturing. Plug it into a PC and the capture quality ramps up to 1080p, although it's only at 30fps. In this mode you'll also need to use the included software, which we found a little cumbersome and flaky. It's a common complaint of these devices though.

There are more affordable capture options available, but they can't be operated without a PC. Whether or not you'll find the price amenable comes down to two features – do you need to capture on multiple platforms, and is it easier for you to capture without access to a PC.

Unfortunately it doesn't have the technology to make you play your games any better, so just bear in mind that the entire internet will be able to watch your gaming moments of shame in HD if you're using this box.

Bennett Ring

Verdict

Able to capture any platform without the use of a PC, the convenience of this box is offset by the higher price and lower capture quality.

GAMING MOUSE

$95 | WWW.RAZERZONE.COM

RAZER NAGA 2014

Put a fistful of buttons at the tip of your thumb.

The tech industry is one that pumps out minor updates to products to make them seem new, and gaming peripheral maker Razer is no saint. Its Naga line of MMO mice are, in particular, well-known for their myriad variations, but with real competitors Razer had little reason to do a proper revamp of the old 2009 design.

The MMO mouse category became more competitive last year, however, with Logitech nipping at Razer's heels thanks to its G600. Razer has responded with a new 'Naga 2014' edition, but this refresh is more than the usual minor tweak or rework. This is the most significant change the Naga has received, bringing the ageing design more in line with Razer's recent mice – particularly the Taipan. That means it's a little less bulbous, but still exceptionally comfortable in the palm. And on top of that there's a new 8200dpi laser sensor and more critically, mechanical switches. That actually makes a huge difference to how it feels and reacts in use. The original buttons were quite squishy, and when you've got a large group of small buttons in a tight cluster, having sharp physical feedback matters.

The new ones are far easier to feel your way around, with a short, clean clicking action. Combined with more varied button shapes and angles, it's much easier to know when you've pressed a particular button. Razer's Synapse configuration software has also improved with version 2.0, making macro creation (and variation) relatively simple.

This isn't a mouse for everyone, but if you're an MMOer looking for the best dedicated mouse around, this is the new king. ■ Dan Gardiner

Verdict

The redesigned Naga puts Razer back at the top of the MMO mouse tree.

★★★★★

GAMING HEADSET

$180 | SKULLCANDY.COM

SKULLCANDY PLYR1

No vowels were harmed in the making of this headset

Better known for their "fashion" headphones geared toward the youth market, it comes as no surprise that shortly after Skullcandy's acquisition of the Astro brand, we're seeing some cross-pollination in the marketplace... thankfully without the premium price tag.

Like the Astro A50, the Plyr1 comes as two parts; the headset, and a wireless base station that also doubles as a headset hanger for storage. The headset itself is made from a durable plastic finished with well-padded cloth cans and headband. It's nice and light on the head with very little in the way of the clamping on our misshaped heads.

There's a boom mic that folds down on the left side and the right side features the power, an EQ switch for toggling between the three presets (bass, flat and trebly), as well as the weird volume control analogue-stick-thing used for awkwardly mixing in-game sound and chat levels. They're no slouch sonically either and perform well above their pay-grade. Lows are nice and punchy without sacrificing or dirtying the source when driven harder.

The USB-powered base station belies its small form factor and manages to pack in a lot of punch, boasting 3.5mm auxiliary input as well as both optical in and out to act as a pass-through to other playback devices. The wireless technology, range and reliability simply can't be faulted, as it's essentially the same 2.4GHz copy/pasted from the A50s. We easily managed to grab a drink on the other side of the house without signal loss. Great for those in the market for a decent sounding wireless headset for a below-average price. ■ Troy Coleman

Verdict

A great sounding, comfortable and moderately priced 7.1 gaming headset with flawless wireless technology.

★★★★½

GAMING KEYBOARD

$190 | WWW.LOGITECH.COM

LOGITECH G19s

A function-rich keyboard that's heavy on the tech but light on the logic.

This is Logitech's new flagship, non-mechanical, gaming keyboard. Quite the accolade, we know. And it would like you to know that it's all about improving the construction materials on previous G-series boards to bring you the last word in comfort, functionality and inessential gizmos such as that LCD display.

And, as with all enthusiast kit asking you for such a huge outlay, the question is: are those extras going to improve your life? Or do they exist solely to justify the price?

It's not as leading a question as it sounds – we're genuinely in two minds about this one. With the average online price coming in at $190, we were ready to sell it down the river with barely a half-star to float on. After all, God's own keyboard probably didn't cost more than $100. And that's got rainbow-coloured Cherry MX switches!

But there are real boons to the design of the G19s. They're thoughtful, if opulent, additions to the – let's face it, hard to sex up – traditional keyboard package, and go some way in justifying that chunky price tag. The wrist rest, for example, is hydrophobic and designed to remain cool during use. The glossy finish on the board itself is smear-resistant and, try as we might to dispel it as marketing hogwash with our greasy digits, it really works. The spacebar, however, along with the 'G19s' decal above the arrow keys, isn't nearly as impervious to my ginger-tinged Cheezel-fingers.

Then there's the adjustable screen and Logitech's array of applets it can be used with. You can use it as a webcam window, a mini YouTube player, a clock, a CPU temperature monitor, an RSS reader, a picture viewer or even a profile selector. The display is powered by a separate power adapter which does mean you have one more cable to worry about, and one more occupied plug socket, as well.

WHERE'S THE MECH?

The keys themselves aren't mechanical like the G710+, but at least they're uniformly non-mechanical. We still dry-heave occasionally when hitting the Corsair K90's plasticky macro keys after the lovely Cherry MX alphabet keys. That said, the K90 costs under $100 now, and the G19s is a $190 keyboard. A $190, non-mechanical keyboard...

The G19s offers a veritable surplus of macro keys – 12 individual buttons and three patch buttons, making 36 programmable macros overall. And that's just the start of its impressive array of extra keys – there's also a toggle switch that disables the Windows key functions, a volume roller and mute key, as well as controls for the LCD screen.

But we're still not entirely sold on the usefulness of any of this. Deep in your heart, you know you'll use the display as a YouTube player exactly once, probably when you first get it, and then never again.

The G19s has a saving grace in the form of comprehensive profiling software that can be configured for individual games – even down to colour preferences for backlighting – but still there's no one giant feature that manages to justify that considerably chunky price. **Phil Iwaniuk**

Verdict

Features	★★★★★
Performance	★★★★★
Value	★★★★★

For greasy-fingered YouTube addicts it's a no-brainer. Everyone else will run a mile from that cash-devouring price tag.

ULTRA-SLIM TILTING WALL BRACKET

- Wall bracket for large 37"-63" TV's
- Supports flat panel TV's up to 75kgs
- Low profile of only 46mm

$51.45

BT-PLB43

ELECTRIC PROJECTOR SCREEN

- Electric 16:9 Aspect Projector Screen
- Infra-Red remote control operation
- Large 3M x 1.68M

$276.00

BT-PSAA135

Brateck

BRACKET TECHNOLOGY

"For the many screens in your life!"

SECURE ENCLOSURE FLOOR STAND

Secure iPad display with lock
Bolts to floor for added security
Padded internally to protect iPad

$79.95

BT-PLB43

FREE STANDING DUAL MONITOR STAND

DUAL Horizontal Monitor Stand 13 - 27"
Adjustable height, tilt / pan and rotation
10 Year Warranty

$98.00

BT-LDT02-T02

CARBON STEEL DESK CLAMP

Steel Desk Clamp for Tablets
Flexible arm with 360° rotation
Convenient hands-free tablet usage

$59.95

BT-PADE2

Available Nationally from Officeworks

Distributed by: Anyware
1300 269 927
www.anyware.com.au

apc RECOMMENDS

TABLET

$530 (16GB WI-FI) | WWW.SONY.COM.AU

SONY XPERIA TABLET Z

Sony aims to deliver a classy Xperience.

The Xperia Tablet Z is, in many ways, a delightful device to use. Sony's got a lot right with this one – it's the third major 10-odd-inch Android tablet it's released over the last couple of years. While its understated look may be a little on the plain side, the Tablet Z more than makes up for that in the usability department.

Some of that comes from physical niceties – it's clad with soft-touch matte plastic on the back, has a very thin 6.9mm profile and weighs just 495g (considerably less than an iPad and most other Android 10-inchers). The other half of that usability comes from added durability; like its Xperia Z smartphone counterpart, this tablet is both dust and water resistant (to IP57 standards) so it can take a bit of rough treatment when necessary.

We did some serious testing of the unit's waterproof claims too, putting it through its paces during a 20-minute hot shower (which even included a video call). It didn't skip a beat. To keep it waterproof, all the major ports and sockets have rubber-lined plastic plugs that slot in neatly and invisibly.

BLOAT FREE

The Tablet Z isn't, however, overflowing with features when it comes to flashy software extras – but that's actually a good thing in the case of Android devices, where the latter are often of dubious value and sometimes don't work like they're supposed to. (We're looking at you, Samsung Galaxy S4.) While Sony's tweaked the look and feel of Android, the adjustments are only subtle – these aren't the kinds of changes that impact performance, with the Z proving to be responsive and quick in general use as well as when launching apps and games.

That said, while the Z is certainly no slouch when it comes to speed, packing a 1.5GHz Qualcomm Snapdragon S4 Pro CPU, Adreno 320 graphics chip and 2GB of RAM, it's outclassed (and fairly significantly, in some areas) by devices just released over the last 6 weeks – the 2013 Nexus 7 and HP's SlateBook 10 x2, for example.

There's little in the way of hardware expandability either – just a microSD slot (letting you add up to 64GB of additional media storage).

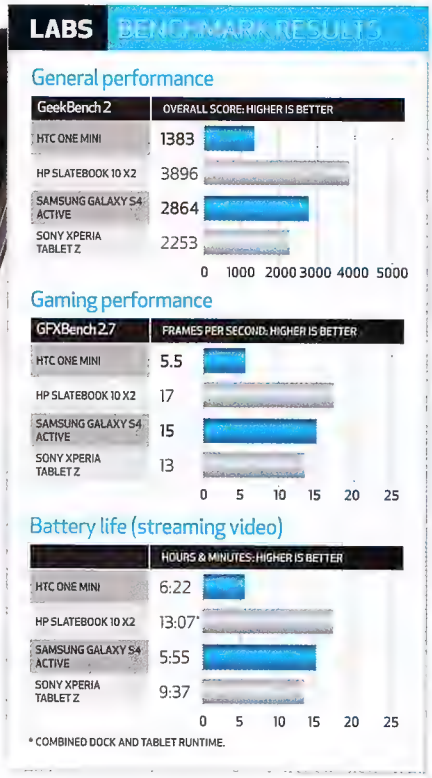
We're also not quite as chuffed with the price – $530 is a bit on the high side for what is still a 16GB Wi-Fi tablet (even one with a 1,920 x 1,200-pixel screen).

The battery life was at least passable in our tests, however, with the Z lasting around nine and a half hours in our streaming video playback test. This keeps the processor, screen and Wi-Fi constantly working throughout the entire test period, so it's a good simulation of real-world usage.

THIN IS IN

And on the whole, that low weight, water- and dust-proof build and slim design do go a long way to making this one both very usable and physically appealing. Despite that slightly sub-par performance, this is our current favourite of the 10-inch Android tablets on the market. If you're after a tablet that's both stylish and robust, you could do a lot worse than this.

Dan Gardiner



Verdict

Features	★★★★½
Performance	★★★½☆
Value	★★★½☆

Slim, lightweight and tough, this is a great example of how to build an Android tablet.

★★★★½

TABLET HYBRID

$600 | WWW.HP.COM/AU

HP SLATEBOOK 10 X2

The PC giant's second stab at Android pays off.

APC's seen its fair share of Android tablet-hybrids like this SlateBook over the past couple of years – Taiwanese vendor ASUS, in particular, has gone a little mad for the things, pumping out around 10 different models in that period. While HP's turned up a little late to the Android scene and didn't quite get its earlier Slate 7 right (see *APC* October, p26), this second tablet from the PC giant does have some appeal.

For one, it's both classy looking and reasonably functional, marrying a detachable 10.1-inch tablet (running Android 4.2.2) with a keyboard dock that also houses a second battery inside. While the design is unashamedly plastic from top to bottom, it's got a rigid and robust feel that never feels cheap. And in terms of hardware features, it's also stacked – there's a 1.8GHz Nvidia Tegra 4 T40S CPU under the hood (the first Tegra 4 we've seen in *APC* Labs) with an Intel HD Graphics 4000 graphics chip (yes, you read right; an Nvidia CPU paired up with an Intel GPU), plus 2GB of RAM and 16GB of onboard storage. Combined, those blitzed every one of our tablet benchmarks – this is the fastest Android device we've tested for both general and gaming performance.

It doesn't skimp when it comes to external features either. The screen's a 1,920 x 1,200-pixel LED-backlit LCD which is bright, clean and clear in use; there's a microSD card slot to expand media storage; and the dock houses an HDMI output, SD card reader and a single USB port for plugging in peripherals or portable storage.

Android 4.2 is also flexible enough that it's reasonably capable in this hybrid sort of role – arguably moreso than Windows 8 even. Google's mobile OS has excellent keyboard and mouse support, for example. There's an onscreen mouse cursor, as you'd expect, but also the ability to Alt-Tab between programs and two-finger scrolling on the trackpad. And thanks to dedicated keys for Back, Home and Task Switching, you only occasionally have to reach up and use the touchscreen.

The design impresses in other areas too – in testing, the combined battery life was just over 13-hours, and the battery drains from the keyboard dock first and only starts eating into the tablet's internal cells when the dock is almost empty. Moreover, HP's decision not to mess with Android – this is basically the stock version direct from Google, with no unnecessary reskins or changes made – means that this is a very fast and responsive little unit.

On the downside, tablet apps are still a bit of a problem for Android – there's simply not enough good, polished ones, especially compared to iOS. It is improving, and Google's own apps are all quite functional on a tablet, but third-party support is a little more mixed.

If the SlateBook 10 x2 has one main hardware problem it's that, as a combined unit, it's a little heavy. Despite the relatively small footprint, the whole unit weighs in at 1.26kg – 200g heavier than most 11-inch laptops. The tablet alone is a more reasonable 600g.)

All up, this is a neat little tablet hybrid device that does get a lot right. Unless you're an Android die-hard, however, with similar low-cost Windows 8.1 devices and new iPads on the horizon, we'd be tempted to see what they'll offer before committing to this one.

Dan Gardiner

Verdict

Features	★★★★½
Performance	★★★★★
Value	★★★★½

A top-performing Android tablet-hybrid in a compact (if slightly heavy) package.

★★★★½

SMARTPHONE

$699 | WWW.SAMSUNG.COM/AU

SAMSUNG GALAXY S4 ACTIVE

The S4 for the outdoorsman.

Samsung often cops flack for the plasticky build of its Android phones, and while this new variation on the flagship Galaxy S4 doesn't totally solve that problem (the chassis is still plastic) it does successfully address the underlying question of toughness in other ways.

The Active's key selling features are that it's both dust and water resistant; the latter means it can sit underwater for at least an hour before risking damage. It's still an S4 underneath however, with basically identical core hardware: a Snapdragon 600 CPU running at 1.9GHz, Adreno 320 GPU, 2GB of RAM and a removable 2,600mAh battery. There are just as many differences as similarities, with new plastic main hardware buttons (Menu, Home and Back), a 5-inch 1080p LCD screen (the regular S4 sports AMOLED) and a slightly thicker, heavier (by 20g) body. The main camera is likewise downgraded (8MP instead of 13MP). Those are changes that many people would be willing to put up with for the improved durability and outdoor worthiness — and that LCD screen does offer better visibility in sunlight, too.

If the Active does have one shortcoming, it's battery life. In testing it fell so short of the regular S4 that we tested the battery twice. The results were the same both times. Where the S4 managed to last over 9 hours streaming video over Wi-Fi, the Active only managed around 6. With most recent flagship phones we've seen managing 7 hours, that's a surprisingly sub-par result — and it means, somewhat ironically, that if you're a highly-active smartphone user, the Active may have trouble keeping up.

Dan Gardiner

Verdict

Brings better durability to the S4, but the cost comes in battery life.

SMARTPHONE

$480 | WWW.HTC.COM

apc RECOMMENDS

HTC ONE MINI

The Android phone designed for iPhone lovers.

As the name suggests, the One mini is essentially a slightly smaller version of HTC's One — this more compact unit has a 4.3-inch screen versus the original's 4.7-inch. This isn't just a different chassis and screen size however — HTC bumped this One down a notch in other areas, with the screen falling to 1,280 x 720 pixels (compared to 1,920 x 1,080), a 1.4GHz dual-core (rather than 1.7GHz quad-core) Snapdragon CPU and half the RAM at 1GB. There's also 16GB of storage, compared to 32GB.

How much difference that makes to you will depend on what you use your phone for. If you're the type who likes to pack your phone with apps, games and media then that lower storage is going to hurt. And if you're a mobile gamer looking to futureproof against graphically intensive games then we'd suggest avoiding this one too — it's typically around half the speed of the One in most gaming benchmarks.

For more general tasks, however, there's nary a spec of noticeable difference when comparing the two. The Sense 5.0 interface is in full effect here, and while we're normally against such Android-interface resins, HTC's makes both the One and One mini feel exceptionally smooth and responsive in general use. The metal chassis makes this one feel almost unbreakable — well, except the screen, of course, though the latter is clad in Corning's latest Gorilla Glass 3.

Compared to an iPhone 5/s, the mini is a little taller, wider, thicker and heavier. If you're keen to jump over to Android from an iPhone though, then this unit is about as smooth a transition as you'll find.

Dan Gardiner

Verdict

Though this is definitely a mini One, there's still plenty to like here.

software

» APPS FOR ALL THE PLATFORMS

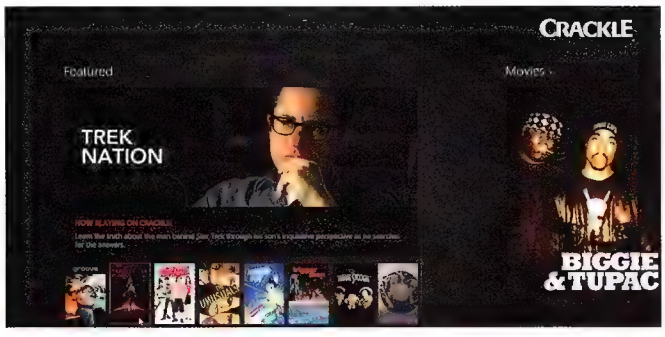
Windows 8 store

Crackle

Free films on your PC.

FREE | CRACKLE | TINYURL.COM/M324V7J

You usually have to do a number of rather naughty things to get free movies online, but Crackle puts them all straight on your Windows 8 computer, legally. The service — which was one of the few of its kind available internationally — includes some pretty nifty offerings, such as the Kirsten Dunst-starring Dick and Jon Lovitz's comedy *High School High*. As a free app it's inevitably got to be funded by something, so you will see the occasional advert pop up. It's worth hunting around the app to find some great movies, including documentaries *Kurt & Courtney* and *Biggie & Tupac*, Harvey Keitel movie *Bad Lieutenant* and a bunch of classic Marx Brothers comedies. You can spend the money you've saved on an extra-large bucket of popcorn, too.



Hotels.com

FREE | HOTELS.COM | TINYURL.COM/KVYG3UJ

Undoubtedly the coolest way to book accommodation, Hotels.com's app is one of the slickest and most fluid we've seen. You can search for hotels by continent or country, or simply tap and pinch your way through a Bing-powered map to find your ideal destination. Once you've chosen your room, you can then book it for your intended travel dates. As it ties into Hotels.com's site, you'll also find reviews and ratings from millions of other travellers around the world, and there are frequent money-saving deals to take the sting out of that continental break. It's also completely secure, so you won't have to worry about an internet cretin nabbing your card details.

ParticleArt

FREE | BIT-101 | TINYURL.COM/MU9VUJB

Add 'attractors', change their force and move them around the screen. Swipe up, choose 'Start' and see what happens. We don't want to give too much away, but it's a fascinating blend of art and science.

Homebrewers Toolkit

$9.99 | BELGIAN BREWER | TINYURL.COM/KJEXEWL

Brewing your own beer is a fascinating process. This app includes loads of info on malts, yeasts and hops, and it'll even let you know what your finished beer will taste like based on its ingredients.

PhotoWeaver

FREE | WISHNUU | TINYURL.COM/MQBPEZ4

If you've got a huge collection of photos on social networks, PhotoWeaver will display them in one place. It works with Google+, Facebook and SkyDrive, and will also display photos stored on your PC.

RealPlayer Daily Videos

FREE | REALNETWORKS | TINYURL.COM/MX4FVD3

Can't decide what to watch? This app curates must-watch clips from lots of sources, so you're sure to find something good.

The Particles

$4.99 | SCIENCE PHOTO LIBRARY | TINYURL.COM/K9ZH7TK

Particle physics is notoriously hard to understand, but this science-based app does a good job of introducing some incredibly complex theories and ideas. It's stunning, too.

Morphwiz

$4.99 | WIZDOM MUSIC | TINYURL.COM/LMKEH3N

MorphWiz is a an expressive musical instrument and visual experience for both beginners and seasoned musicians.

Mac » APPS

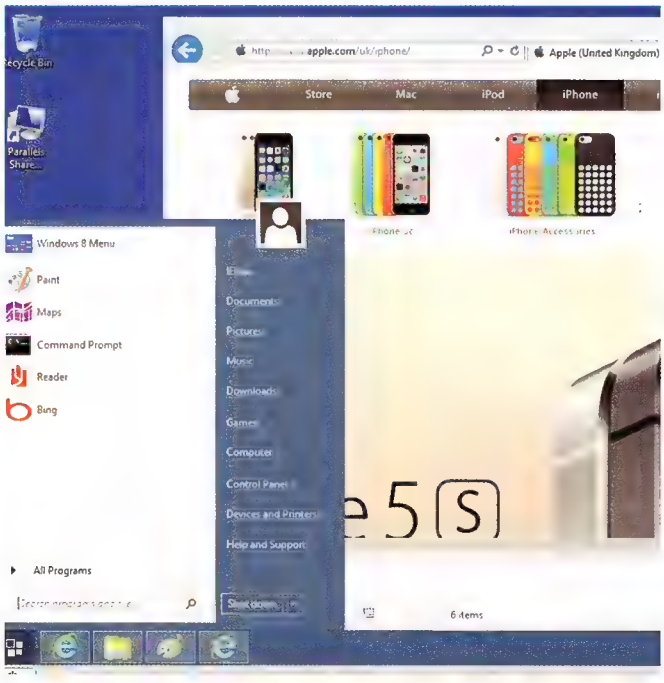
Parallels Desktop 9

Faster, powerful, and able to revert Windows 8 to a previous incarnation.

$89.95 | PARALLELS | WWW.PARALLELS.COM

If you're new to virtualisation — basically, running another OS as its own self-contained application — Parallels Desktop 9 for Mac is a pretty easy sell. It's fast, usable, stable and configurable; as long as you're not wanting to play particularly recent games, it performs admirably when running almost any Windows applications you care to throw at it. You can run said apps full-screen, across multiple monitors (set-ups are now 'sticky' between locations), or with Windows windows nestled among Mac ones.

Upgraders need to weigh up whether the new features are worth the price. There are plenty of nice ideas, but little in the way of a wow factor. Support for new operating systems (OS X Mavericks and Windows 8.1) is the big draw, but Parallels Desktop 8 works fine with betas of both. Bar performance boosts for shutdown/suspension of virtual machines, you now also get: printing to PDFs (which worked fine during testing, albeit really slowly), PowerNap support; cloud-service sharing between virtual machines and OS X, to avoid duplicate caching, Thunderbolt and FireWire drive assignment as per previous



USB drive functionality, and a 'Windows 7 look' for Windows 8. The last of those is an integrated installation of Stardock's Start8 and ModernMix. Use Boot Camp and the Windows 8 install will bug you to register, but in Parallels Desktop, the add-ons enable Modern UI apps to work in Coherence mode rather than forcing you to full-screen. Still, this is a very specific and somewhat slight update that cements Parallels Desktop 9 as a nice-to-have rather than a absolutely-must-have upgrade.

McAfee LiveSafe 2014

If you have more than a couple of eligible devices, McAfee LiveSafe is a good-value option for protection.

US$79.95 | MCAFEE | WWW.MCAFEE.COM

McAfee LiveSafe aims to provide security for the typical family with multiple devices. It includes protection against malware, spyware, browser-based phishing attacks and offers secure password management. Not every feature is available on every platform, though: Windows users get additional parental controls, anti-spam and control over social network use, and the Mac version also lacks support for Personal Locker, which gives 1GB of free securely encrypted storage — although this is available on iOS.

LiveSafe's anti-malware protection detected all the common Mac samples we used with it in our tests. It detects and prevents 'bad' software from being written to disk, although it doesn't automatically run a full scan on your drive when it's first installed (this would help detect any pre-existing infections). However, you can easily do this manually.

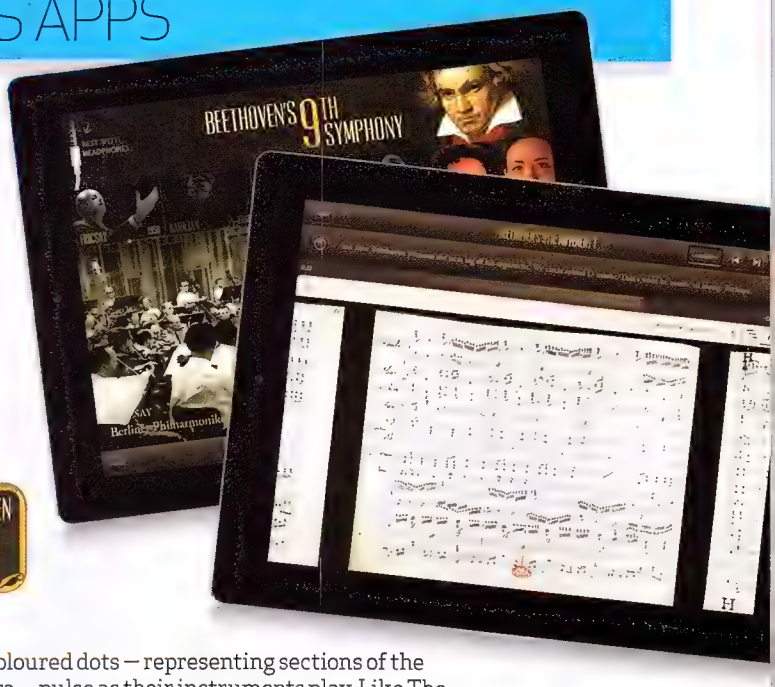
The anti-phishing protection also worked, showing a green tick in search results on known-good sites. Unfortunately, the only supported browsers are Safari and Firefox. The password management feature of LiveSafe works very well; it isn't as comprehensive as something such as 1Password, but it's quick, effective and works cross-platform.

McAfee LiveSafe is perhaps a little lacking on the Mac side, but we hope that more of the Windows features make it over to OS X soon.

Beethoven's 9th Symphony

Discover why this symphony is considered one of the best.

FREE WITH IAP OR $7.99/$13.99 | TOUCH PRESS | TINYURL.COM/KTZDN89



If you enjoyed Touch Press's app The Orchestra, you'll be pleased to get more insight into beautiful classical music with Beethoven's 9th Symphony – it's a rich, engaging exploration of how this piece comes to life. With the focus on one piece of music this time around, you can delve deeper into the performances by four orchestras, conducted by Fricsay, Karajan, Bernstein and Gardiner. Only one – the Bernstein performance – has accompanying video footage, but that scarcely matters.

The choice of the ninth is an excellent one; it's widely considered one of Beethoven's greatest works, and its final movement, popularly known as Ode to Joy after the poem whose words it incorporates, is instantly familiar. As well as the performances and scores (which include photographs of an 1825 Royal Philharmonic Society manuscript), there's a written story of the symphony and insights in the form of video clips from 10 experts. There's also a wonderful graphical view where coloured dots – representing sections of the orchestra – pulse as their instruments play. Like The Orchestra, Beethoven's 9th feels like it's been made with real love for the music.

If you're interested in Beethoven and particularly this symphony, the app is a must. Even if you have no more than a passing interest in classical music however, it's still a wonderful way to broaden your horizons. There's also an iPhone version available.

Office Mobile

FREE (WITH OFFICE 365) | MICROSOFT | TINYURL.COM/L5VY2L7

Microsoft has finally released a version of Office for iOS, including Word, Excel and PowerPoint, but if you're using an iPad you're out of luck: this is an iPhone-only app. It's also only for subscribers to the $119 per year Office 365 service. It has a simple, modern interface that offers easy access to SkyDrive-stored documents, but the functionality is basic. Offline document creation is theoretically supported, but when we tried it, the saved file had vanished. And only new files are supported: Word 97-2003 files can't be edited. Word offers basic formatting, but doesn't support styles, or even just changing the font, though it does support commenting. Excel feels more powerful, and is probably the highlight of the suite here. PowerPoint is just a glorified slide viewer, though. You can edit the text on slides and add notes, and that's it. It's all just too basic compared to the competition it's up against.

Mixprintpaint

$1.99 | RAPHAEL OZAWA | TINYURL.COM/KYHYFDL

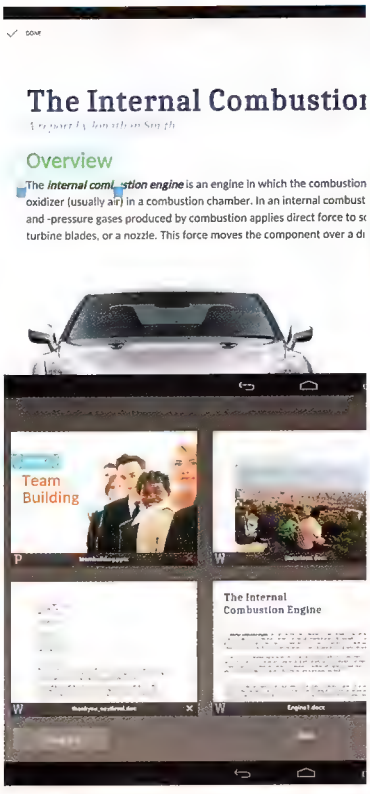
MixPrintPaint aims to save parents cash on colouring books while encouraging creativity by getting their kids to design their own scenes, which they can then print out and attack with crayons on actual paper. Creating the scenes is a doddle — you pick a themed background and then drag and drop characters or objects onto it. The characters are well drawn and you can resize them with a pinch gesture or flip them with a double-tap. This teaches kids about perspective and depth in a scene. While there are plenty of characters and objects to choose from, we wish there were more backgrounds or theme packs available — three seems a bit limited. We hope to see something like 'Space' or 'At the Zoo' arrive as IAPs, which we'd happily pay for. The printing options are good — you can print the whole scene or the characters separately so kids can cut them out and stick them on the old-fashioned way.

Combo crew

$1.99 | THE GAME BAKERS | THEGAMEBAKERS.COM

Rather than rely on virtual buttons, this cartoon brawler is about swipe and tap. Moving is dealt with automatically; use a tap to block incoming attacks and swipes to dish out digital destruction. The game's setting brims with clichés as you brawl your way through stages, up to fighting Mr Boss. For the most part, it works. A single swipe provides a basic attack, and double-swipes unleash devastating combos. When the super meter fills, you zigzag over foes to duff them up with no threat of retaliation. Incoming attacks are signposted in advance for individual foes, so it sometimes feels like a rhythm action game, with you doing a kind of block/counter dance to ramp up your combo streak. It can be a bit of a grind as it goes on, but there's still nuance in the strategy of using combos to build up more powerful attacks.

Google Play » ANDROID



Quickoffice

Compatibility and value make a strong team.

FREE | QUICKOFFICE | TINYURL.COM/CFUU9NX

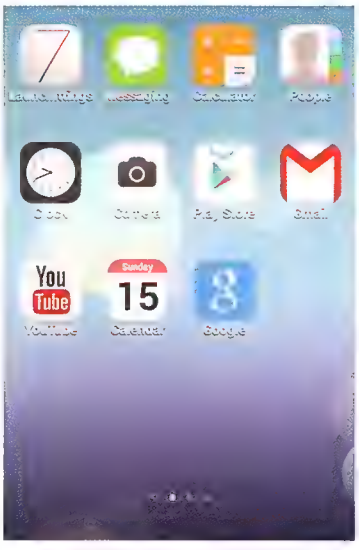
If you want to work with documents on the go, you've got about a zillion free options, but typically the ability to edit the holy grail of Microsoft Office formats (which most people use on their PCs) has come with a price tag attached.

Quickoffice has been a notable player in this space for years now, and Google, which acquired the company last year, has now rereleased Quickoffice for free (on both Android and iOS), meaning you can edit Word, Excel and PowerPoint files on your device – or in Google Drive – for nix. The cost negation might be Google's retort to Apple's similar moves with free iWork apps for new Apple devices... but in any case, there's no reason not to download this.

Homestyler

FREE | AUTODESK | TINYURL.COM/K8558N3

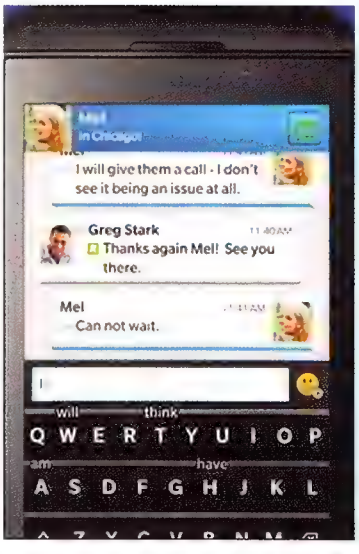
Once upon a time, wannabe architects and budding home renovators had to content themselves with dodgy PC CAD software that had a nasty habit of making their designer lifestyle fantasies resemble early polygon-heavy virtual reality games with all the CGI sophistication of Dire Straits' classic 'Money for Nothing' video clip. No longer! Homestyler is a fantastic free app from Autodesk that gives you a huge amount of power to visualise the home you want to make. Take a photo of an empty room and in seconds you'll be populating it with realistic, scalable and fully rotatable 3D models of furniture and fittings from real (albeit US) brands. Fun to play with and a great fount of DIY inspiration. Plus, arranging and superimposing miniature couches on a photo of your work desk was never quite so easy.



IOS7 launcher

$1.02 | TEAM ASHRON | TINYURL.COM/KWGBJF7

We're a funny bunch, geeks. On the one hand you've got the rabid OS fanboy, the type of user who can't help but start Android vs Apple flame wars on any forum or news story vaguely related to technology. Then you've got the subset of users who enjoy installing custom skins and launchers that emulate other operating systems (cross-OS'ers you might call them, tee hee). In this case, it's iOS 7. This effort by Team Ashron is just one of several new Android apps that ape the design and UI of Apple's latest (with varying degrees of success). The irony is that some of iOS 7's best features were actually 'borrowed' from Android... but if you must have Jony Ive's fluoro palette, here it is. Kind of.



BBM for Android

FREE | BLACKBERRY | TINYURL.COM/M6OSM4E

BlackBerry is in a rocky place after the last few years, having lost bucketloads of customers to rivals Apple and Google, and the uptake of its BB10 platform hasn't been the second coming that was promised. Scrambling for a commercial foothold, one of the company's more surprising strategies has been announcing it will bring its popular messaging service, BBM, over to Android and iOS. Alas, a last-minute leak of an unfinished version meant the official launch has been delayed, but by the time you read this it's likely arrived. Many Android/iOS users might question the value of yet another messaging platform, but the benefit is considerable: a free, instantaneous comms channel with the millions of BlackBerry users the world over. (Just don't mention WhatsApp.)

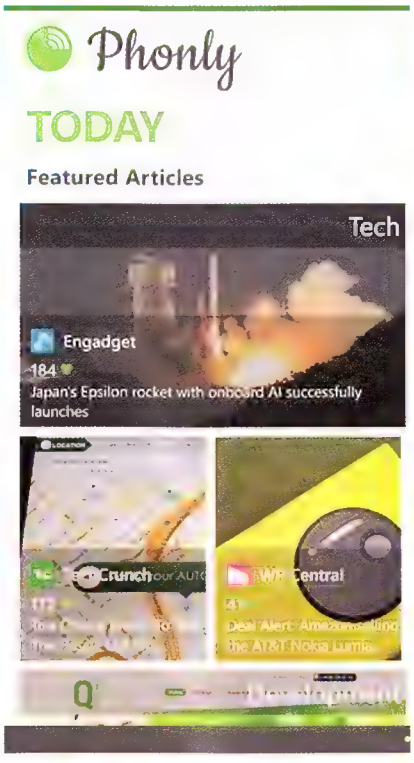
Phonly

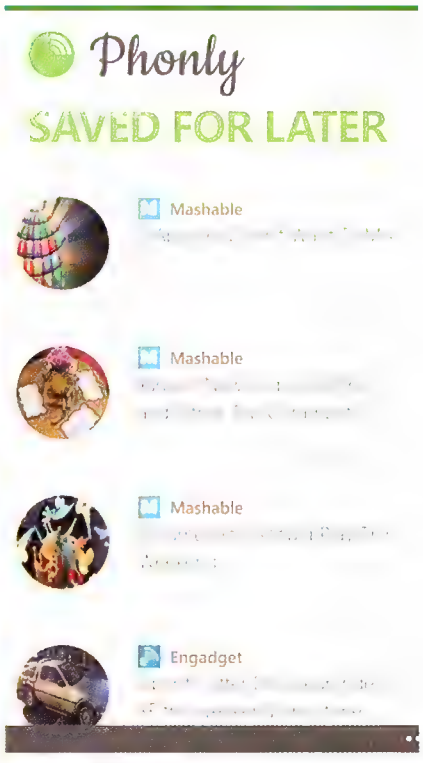
Feedly steps in for Google Reader, Phonly steps in for Feedly.

FREE (WITH IAP) | GEEK INDUSTRIES | TINYURL.COM/MHGMVCW

The untimely demise of Google Reader was one of the bigger web shockers of the past twelve months, but if any thing the online reaction has only fortified RSS and its standing as a staple of internet comms for the next generation.

Feedly has stepped up as the MVP candidate most likely to absorb the majority of ex-Reader users, and Phonly is an extremely smooth Feedly client for Windows Phone. You can scan today's featured articles or your total feed, browse categories, save stories for later and share to Pocket, Instapaper and more. We couldn't see how to pin feeds to a live tile, but this is supposedly supported. Upgrading to Phonly Pro for $2.49 removes ads, which might be advisable.





Space Weather

$2.49 | TECHNOTIM | TINYURL.COM/LTNZMOF

Checking your local weather forecast is one of the most common things people do on their smartphones, but did you ever stop to think about the bigger picture, meteorologically speaking? The aptly named Space Weather is kind of like any regular weather app, except instead of mundane updates on the chance of rain tomorrow, it's more likely to be warning you of any impending solar storms set to wreak havoc in near-Earth space. Space Weather provides real-time updates on all sorts of current and forecast space weather conditions, issues alerts on solar activity, includes a stack of charts, readings and indexes, and collates space-related news via RSS feeds plus images and short videos. Interesting stuff, if a little over one's head at times (ahem).

Game Quotes

FREE | STEPHEN CERESIA | TINYURL.COM/LUO5F5K

Video games have had such a marked influence on pop culture in the past three or so decades that their own lexicon is virtually as quotable and recognisable to gamers as the popular language of film, literature or music — especially gaming's arcade heyday in the early '80s, when Japanese scripts produced many enjoyable lost-in-translation moments for English-speaking audiences. Game Quotes pays tribute to games from this era, as well as other retro classics on the NES, SNES, Master System and Genesis (aka Megadrive), cobbling together more than 700 poetic (and painful) gems from gaming's yesteryear, presenting them along with their original pixel-tastic screenshots. A historical curiosity to be sure, but plenty of amusing nostalgia for those who were slinging 20c coins and blowing the dust out of cartridges back in the day.

Reaper

FREE (WITH IAP) | DAVID PEROUTKA | TINYURL.COM/N9XNWAN

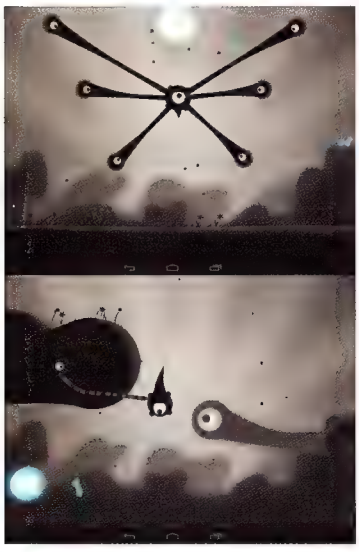
Reaper (full title, *Reaper: Tale of a Pale Swordsman*) is the latest effort from accomplished games developer Hexage. This smooth and stylish action/RPG game sees you traverse a number of side-scrolling 2D environments, encountering enemies and checking off quests as you explore (and defend) the land of the Wilderness. The story might not win any awards but the graphics are gorgeous and the gameplay is polished and addictive. There's a fair bit to experience before you hit the paywall (it's free to play until you reach level 10, at which point IAP unlocks the rest of the game for determined Reapers). Also available on pretty much every platform you'd care to name, not just Windows Phone. Worth checking out.

App World » BLACKBERRY

Crackle

FREE | CRACKLE | TINYURL.COM/LQCPWQA

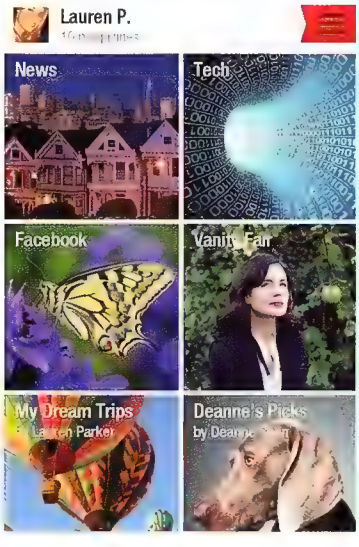
The state of streaming video in Australia is still a bit hit and miss compared to what international users might enjoy (streaming music providers, which you can trip over on your way to work if you're not careful, are another story). But Crackle, which has been around for a while now, is a nice exception to the rule. This Sony-backed web and app service offers plenty of ad-supported TV shows and movies, all completely free to watch. The range can be a bit spotty at times since only a few major catalogues contribute to Crackle's library, but if you're happy viewing recent — as opposed to new — releases and washing them down with some golden oldies, Crackle is a handy video resource for when you're stuck for something to watch.



Contre Jour

$2.99 | MOKUS GAMES | TINYURL.COM/M9BHTCK

Sometimes it seems like mobile gaming is in risk of being taken over by moody, atmospheric black-and-white silhouette-toting adventure games (there are really too many titles to mention that fall into this category) and it might just all be Contre Jour's fault. This award-winning 2D platform puzzler made big waves a few years back when it hit iOS and Android, and now it's belatedly made its inky debut on BlackBerry. You're charged with manoeuvring your cute little critter through some 100 levels, mastering all manner of physics-based control schemes. Beautifully executed with great, atmospheric visuals and a stunning soundtrack. The only question is: why did this take two whole years to make the journey to BB?



Flipboard

FREE | FLIPBOARD | TINYURL.COM/PUZUTSO

Launching first for devices on BlackBerry 10.2 (and likely timed to coincide with the release of the BlackBerry Z30, which should be available in Australia about the time this issue hits the newsstands), Flipboard has finally made its way to the 'Berry. While there's no shortage of other news-reading apps available on the platform, Flipboard's trademark magazine-style page flipping has won the hearts of users the world over, and its newly implemented 'make your own magazine' features have provided bountiful curation opportunities for thousands of would-be magazine editors (and readers). Flipboard's not just about news though; it's tightly integrated with social networks and incorporates support for read-it-later services too. Check it out when it hits.

BlackBerry Virtual Expert

Take your BlackBerry to the doctor.

FREE | BLACKBERRY | TINYURL.COM/ME3HCLV

When something's playing up with your mobile device — and especially when it's not covered by warranty — it can be tricky deciding what course of action to take. Do you live with the hardware hiccups or take it for repair, knowing full well you might be charged through the nose for the service?

BlackBerry Virtual Expert is a knowledgeable middleman to help make your mind up. This easy-to-use diagnostics app runs your device through a number of tests designed to assess your BlackBerry's display, audio and button components. Some of the tests require your input and some don't, but within seconds you'll be able to diagnose whether something is actually wrong. A totally free, must-have tool for when your 'Berry is sick.

IN DEPTH: THE 8.1 UPDATE

REBOOT WINDOWS 8

THE APC TEAM REVEALS HOW YOU CAN MAKE WINDOWS 8 GREAT

Fairly or not, Windows 8 has copped a lot of flack since it came out a year ago. While there are some people out there who love Microsoft's latest OS (it's even received some letters of support from *APC*'s readers), for most people, it's at best something to be slightly wary of.

Most of the complaints about Windows 8 have revolved around the new, simplified Modern user interface (UI) – a system primarily designed with touchscreens in mind, but which has also been foisted onto everyone else, even those of us still using those stuffy old touchless, mouse- and keyboard-driven methods of interaction.

While the Modern UI is certainly attractive, its penchant for full-screen apps and large interface elements – both nice when you're just interacting with your fingers on a 10-inch tablet – do mean that, arguably, it isn't quite as efficient when you've got the higher precision offered by your physical peripherals.

Windows 8.1 doesn't entirely fix that conundrum either, but it's certainly a step in the right direction.

For desktop and laptop owners who don't want touch, some concessions have been made and Microsoft has also worked to make the Modern UI a little more full-featured and flexible in general, letting you access more elements and settings without having to resort back to the desktop interface.

If you're thinking that this very much feels like an OS that's still a work in progress – and we're all along for the ride, whether we like it or not – you're probably not far off the mark. There are some good reasons to switch to Windows 8, however – under the hood it's faster than Windows 7, meaning it runs swiftly not just on new hardware, but older (or less meaty) kit than the latter.

This month, we've dug into the 8.1 update to discover what works and what does, revealed the secrets to making it more usable and uncovered the third-party applications that can help plug some of its gaps.

Combined all of these can help transform Windows 8 from something you tolerate into a good – and perhaps even great – OS.

At any rate, these tips, tweaks and techniques should help tide you over until that inevitable Windows 8.2 update is released...

WINDOWS 8.1 ON TEST

DARREN YATES TAKES MICROSOFT'S LATEST OPERATING SYSTEM FOR A TEST DRIVE TO FIND OUT WHAT'S NEW, HOW IT HANDLES – AND JUST HOW MUCH OF AN UPGRADE IT REALLY IS.

Since the release of Windows 95, no Microsoft OS seems to have polarised users as much as Windows 8. Before the software giant's latest OS outing, releases were almost universally loved (XP, Windows 7) or loathed (ME, Vista). But the changes brought in by Windows 8 have split Microsoft's usually consistent user base down the middle. Some love the new Modern UI – or are at least willing to put up with it in order to gain the OS' performance benefits – and there are those who are seemingly ready to burn the Microsoft logo in effigy over the decision to ditch the Start menu.

Regardless of whether you see the new Windows 8.1 release as the next step in Windows' evolution or an overdue apology for Windows 8, it's not overstating the case that plenty is riding on its success.

WHY '8.1' AND NOT 'SP1'?

Indeed, one of the more interesting aspects of Windows 8.1 is the fact that it's 'Windows 8.1'. In previous generations, Microsoft would be gearing up to release 'Service Pack 1' right about now, but by naming it 'Windows 8.1', the software giant is embarking on a new marketing strategy. From a marketing viewpoint, it makes sense – a 'service pack' is almost an acknowledgement that your product has problems that need servicing, whereas an '8.1' release sounds more positive but also gives the company freedom to chop and change features.

But the question remains – is Windows 8.1 really more than just a Service Pack? After extensively testing the new update, we think it does justify a new name – although we're sure not everyone will be thrilled with some of the changes.

THAT'S A START BUTTON?

If ever a feature dump gave Windows 8 users a focal point for their complaints, it was the removal of the much-revered Start button and menu system. Microsoft argued that everyone now pinned their favourite apps to the Windows Task Bar instead, but the reality is that the Modern UI is central to Microsoft's plan to create an OS that's equally at home on phone, tablet or PC and, in its mind, the old Start menu system had to go.

But the company underestimated consumer backlash at being corralled into a one-size-fits-all interface and in an effort to placate those users, Microsoft acknowledged early on in 8.1's development that the Start button would make a return. While users began claiming an early victory, it soon leaked out it was to be a victory in name only. Sure enough, while it can be customised to show the Modern UI's 'All Apps' screen, we can confirm Windows 8.1's desktop Start button does little more than launch the Modern UI Start page.

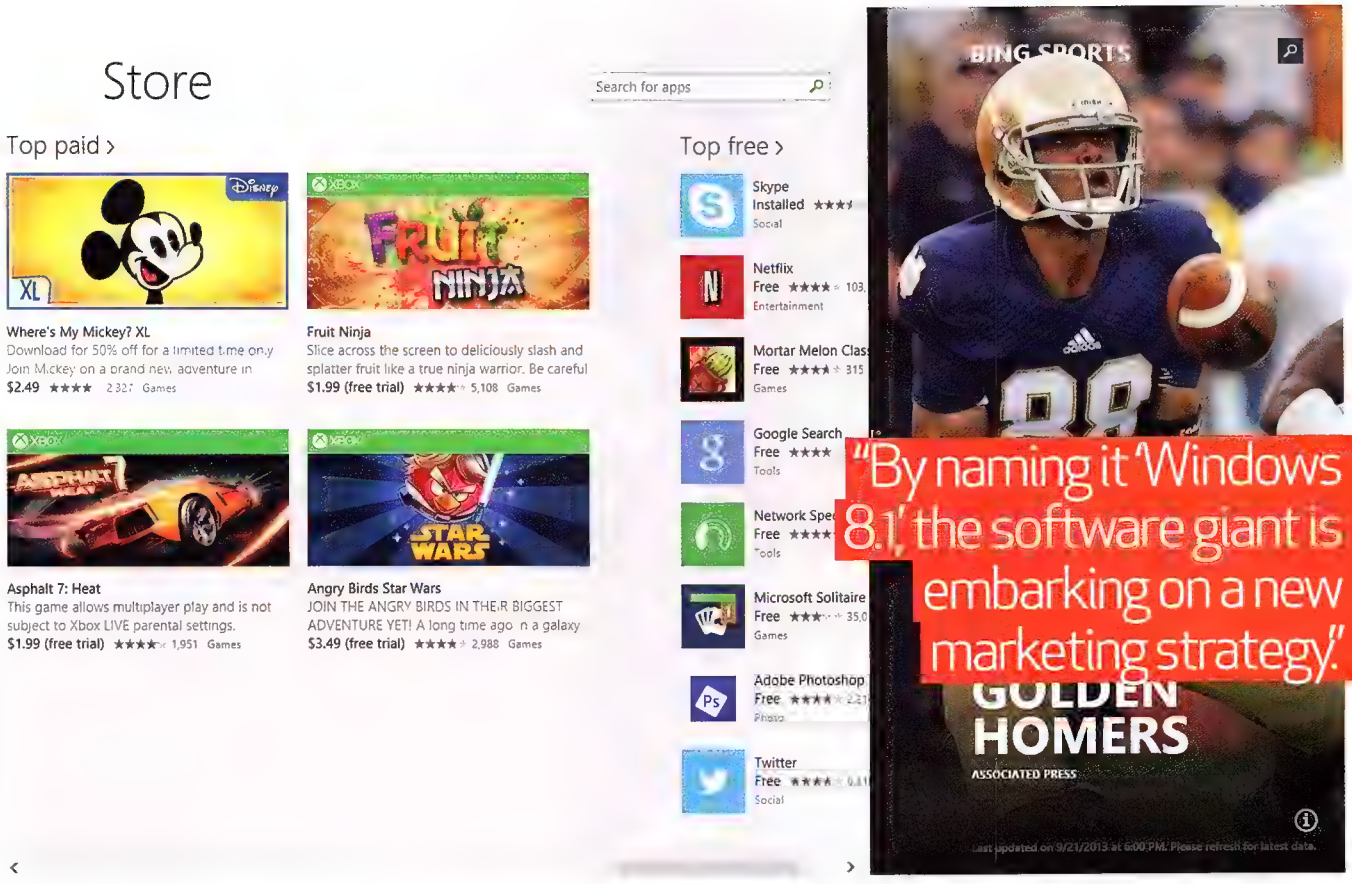
The Modern UI Start page features customisable backgrounds and new tile sizes.

BOOT TO DESKTOP

But far more significant than the Start button is the inclusion of the new 'boot to desktop' option, which enables you to bypass the Modern UI completely. This is much more of an acknowledgement from Microsoft that Windows 8 went too far in pushing users into the new interface. But for those wanting the old desktop environment they had with Windows 7, there's still plenty more to do. Check out our Windows 8.1 Secrets story (see page 46) for how to augment the 'Boot to Desktop' option and make your Windows 8.1 setup look like Windows 7 again.

BACKUP AND RESTORE CENTER DUMPED

It looks as though the idea of feature consistency across a Windows OS generation's lifespan is no longer high on the agenda. Microsoft's move to dump the Windows 7 File Recovery/Backup and Restore Center option (which was included in Windows 8) from Windows 8.1 appears to be a strategic one,



"By naming it 'Windows 8.1' the software giant is embarking on a new marketing strategy."

designed to further point users towards its connected Recovery backup system, which is more device rather than local PC centric. But in the context of an update, it's a bit of a dud move.

Whether or not Windows 7 File Recovery was commonly used is beside the point – it's not great form to remove a feature from an OS with a minor OS update. Get rid of it from Windows 9 if you like, but if a feature was good enough to include in Windows 8, it should remain for 8.1. We'd argue that users should have the right to expect feature consistency over the life of an OS, but this change suggests you'll need to check feature availability more carefully in future.

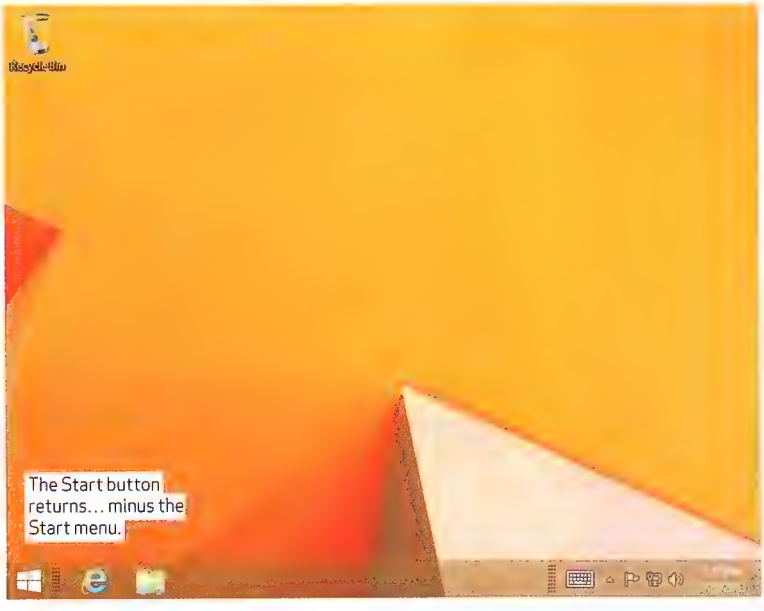
Windows 8.1 will come in two forms. If you've already got Windows 8, you can grab 8.1 as a free update from the Windows Store. It's also being offered as an installable OS that you'll buy at retail, or just receive pre-installed on your next tablet, laptop or desktop PC. For this article, we've tested the RTM 'Build 9600' version of Windows 8.1 Pro before its official release. Since the Windows Store update wasn't available at time of testing, we don't know whether installing the update will also remove the Windows 7 File Recovery function or not. But it's a good bet, as it no longer exists in the Windows 8.1 standalone release.

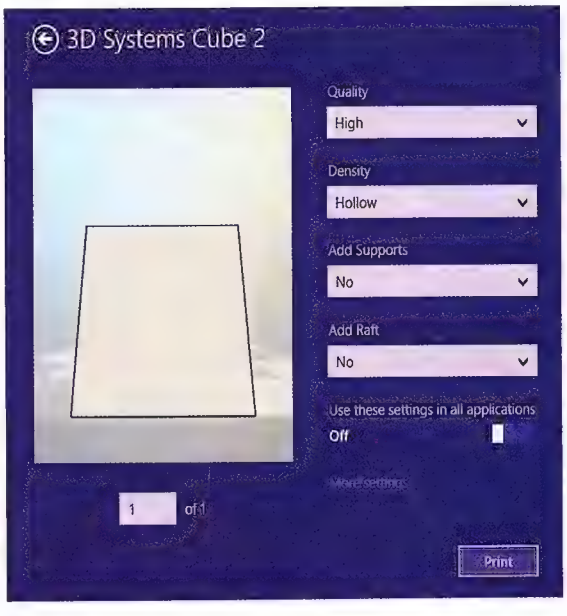
New Modern UI customisations include dynamically-sized multiple app screens.

Microsoft extended its 2D printing pipeline to support 3D with a new 3MF format.

INTEGRATAED 3D PRINTING

One of the real surprises coming to Windows 8.1 is integrated





ASUS' new Transformer Book Trio T100 adds Windows 8.1 for just US$349.

"No Windows release would be complete without a new range of systems to go with it"

NEW WINDOWS 8.1 DEVICES

No Windows release would be complete without a new range of systems to go with it, but this time around, the interest is very definitely in new Windows tablets — and Intel-powered tablets at that. Expect to see increasing numbers of low-cost options powered by Intel's recently-released 'Bay Trail' Atom processors running Windows 8.1.

Here are just a few expected to hit the streets shortly:

Dell's next-gen Venue tablet is said to feature a 1,280 x 800-pixel, 8-inch screen and Intel Atom CPU for an expected price of US$299.

ASUS has already announced its new Transformer Book Trio T100 with Atom processor, 10.1-inch screen, 32GB of storage and docking keyboard with 11-hour battery life for US$349.

Acer is rumoured to be setting up a new W3-810, an Atom-powered version of its Android-running A1-810, which will sell for US$349.

Think back five years and to the netbook craze in full swing; these new tablets will provide far more functionality for less than the price we were paying back then. It's still unlikely we'll see stellar performance from these new Atom processors, but with promises of battery life topping 11-hours, compact, affordable and genuine 'all-day' computing looks set to arrive.

3D printing support. Microsoft clearly thinks 3D printing will be a huge hit with Windows users and is providing the back-end functionality for developers to add simple 3D printing support to their apps. It's coming through OS changes, plus a new 3D printing SDK, the idea being that 3D printing will go from a multi-step process to one as simple to use as selecting Devices from the Charms Bar, choosing your connected 3D printer and clicking the Print button.

Microsoft says that because the 3D printing functionality is an extension of Windows' existing 2D pipeline, users will still see common 'File/Print' dialogs. However, to facilitate future growth, the software giant is also implementing a new extensible XML-based dataset structure called '3MF' (3D Manufacturing Format) to succeed the industry-standard STL (Stereo Lithography) file format. The reason, Microsoft says, is that STL cannot handle multiple colours or material support.

At the time of testing, there were no readily-available apps that supported native 3D printing, so we'll have to wait and see how it works. However, developers can try out the 3D printing code example at **tinyurl.com/kxuagok**. To make it work, you'll also need to download Microsoft Visual Studio 2013 Preview, Windows 8.1 Preview and either have a compatible 3D printer or at least the 3D printer drivers in the 3D printing SDK.

While we love the idea, we think Microsoft is overly optimistic about how easy 3D printing will be. Making the software simple to use is one thing, but from personal experience, we can tell you that the current generation of 3D printers still need considerable hand-holding to produce decent results.

MODERN UI APP DEVELOPMENT CHANGES

One of the more common complaints about Modern UI apps is how samey they look — few controls, big fonts, wide-open spaces. That's not necessarily the fault of the developer, however, but more a function of the tight Microsoft Design Guidelines. One of those principles was the 20 x 20-pixel grid structure developers were required to work with and it's one of the reasons why Windows 8 apps feel open, even wasteful of space. The software giant is now said to be updating this guidance for Windows 8.1 by defining the design grid primary unit to be 5 x 5-pixel. It means you'll find new Windows

With hardware partners deserting Windows RT, what price the OS' future?

WINDOWS RT – CAN IT SURVIVE?

It's hard to see Windows RT being anything other than on its last legs. Despite the fact it has some fans in the IT crowd, support for the ARM-based OS amongst hardware partners has all but collapsed in recent months. Asus recently joined Lenovo, Samsung, HP and HTC in turning their backs on the RT market. That leaves Dell as the only major brand aside from Microsoft that's supporting the OS with hardware. But there's little question that if hardware vendors start shifting x86 CPU-powered Windows 8.1 tablets for under $350 — tablets that can run full Windows apps and that offer 10-hour battery lives — Windows RT is surely living on borrowed time.

Throw in a dearth of decent Modern UI apps, Microsoft's decision to prevent side-loading and make all RT apps come through the Windows Store, plus the high price of Microsoft Surface RT tablets (and a seemingly low market appetite) and it's hard to see a rosy future for Microsoft's ARM-based OS.

8.1 apps will feature smaller fonts, tighter control placement and less wasted space.

MIRACAST

In fact, many of the feature improvements in Windows 8.1 relate to the Modern UI, such as the ability to now dynamically size multiple app windows. But one feature that will bring Windows 8 devices in line with other tablet OSs is the introduction of Miracast.

Miracast is a wireless protocol that allows you to display your Windows screen on another Miracast-compatible display or TV. If you're thinking it sounds like UPnP or DLNA, it's slightly different. Whereas DLNA is about transmitting audio and video-encoded streams, Miracast is a screen-mirroring protocol more closely aligned with Intel's WiDi wireless display technology (in fact, WiDi 3.5 supports Miracast). You can use it to display your laptop screen on a projector for example — all just using Wi-Fi.

So far, it's been demonstrated to work between Windows Phone, tablet and PC devices (**tinyurl.com/pefcp8l**). However, there seems to be a question mark over Surface RT support. Miracast needs a WDDM 1.3 video driver and despite getting a Windows 8.1 update also, it's not yet supported on Surface RT devices and no-one seems sure if Surface RT will receive the required video driver update. Stay tuned.

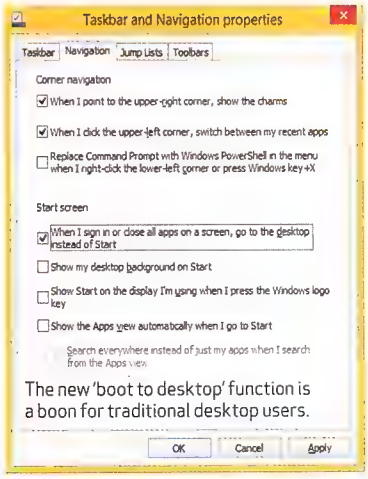
OUR TAKE: UPGRADE OR NOT?

In the past, deciding whether or not to install the latest Service Pack was a pretty simple task — you just did it because the gains always outweighed the losses. This time, since Windows 8.1 is being released as both an update and a new OS, it's not such an easy choice and it's one that will depend on which side of the Modern UI fence you sit.

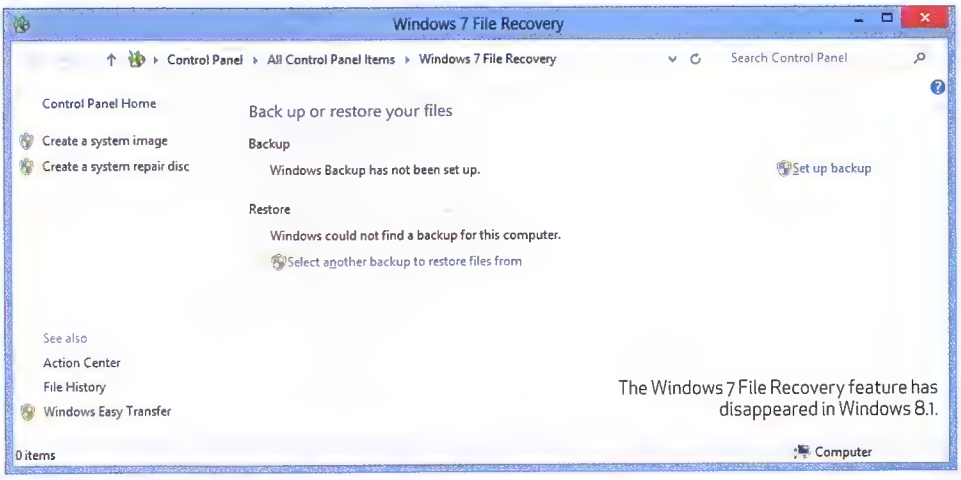
If you're happy with your existing OS, stick with it — if Windows 8 did nothing for you, its unlikely Windows 8.1 do a lot to change that.

If you rely on Windows 7 File Recovery in Windows 8, definitely don't upgrade — its disappearance from Windows 8.1 is a dopey move that does nothing for feature consistency. But if you've never used it, it's probably worth grabbing the 8.1 update to get the 'boot to desktop' feature, if nothing else.

Ultimately, a fair chunk of Windows 8.1 is about Modern UI 2.0 — new changes to the developer guidelines and the considerable improvements to the UI itself will make it even more enjoyable to use if you love it already. And with features like integrated 3D printing, Miracast and Wi-Fi Direct Printing, Windows 8.1 is definitely a must-have for most Windows 8 users.



The new 'boot to desktop' function is a boon for traditional desktop users.



The Windows 7 File Recovery feature has disappeared in Windows 8.1.

Modify the Start Screen's All Apps page to show desktop apps first.

WINDOWS 8.1 SECRETS

DARREN YATES LOOKS AT HOW TO BEST USE THE NEW FEATURES IN MICROSOFT'S LATEST OPERATING SYSTEM.

While the changes to Windows 8.1 won't please everyone, Microsoft has been fairly proactive in some areas, bundling in new technologies such as Miracast and 3D printing. While these will obviously require hardware extras to implement, there's still plenty in the operating system you can take advantage of right now.

RESTORE THE WINDOWS 7 LOOK

It'd be fair to say that while many users like Windows 8's new Modern UI, there are plenty of people who don't. But if you're thinking Windows 8.1's desktop can't be made to run like Windows 7, think again.

Windows 8.1 does come with a fairly anaemic Start button setup, it's true, but as we mentioned in our lead story (see page 42), it also comes with an exceptionally useful feature called 'boot to desktop'.

By combining this feature with a free Start button/menu replacement like Classic Shell, you can get a desktop environment that's very close to Windows 7 but with the performance benefits of Windows 8. Here's how:

STEP 1: TURN ON 'BOOT TO DESKTOP'

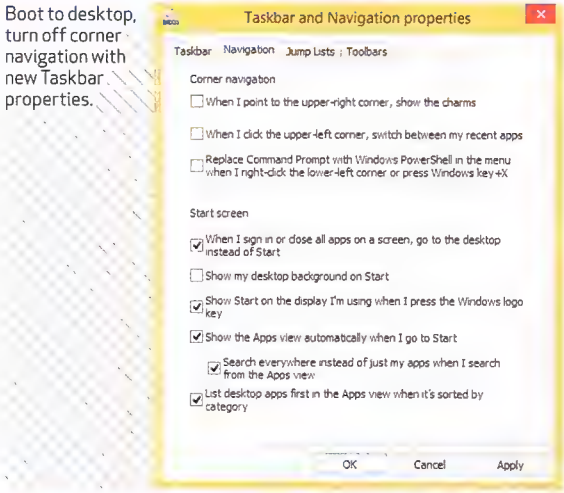
The new 'boot to desktop' is one of the few concessions Microsoft has given to old-time desktop users, allowing you to bypass the Modern UI altogether and boot straight into the Windows desktop environment.

But naturally, this feature is switched off by default. To initiate it, right-click on the open area of the taskbar, choose 'Properties' from the context menu, select the 'Navigation' tab and check the box next to 'When I sign in or close all apps on a screen, go to the desktop instead of Start'.

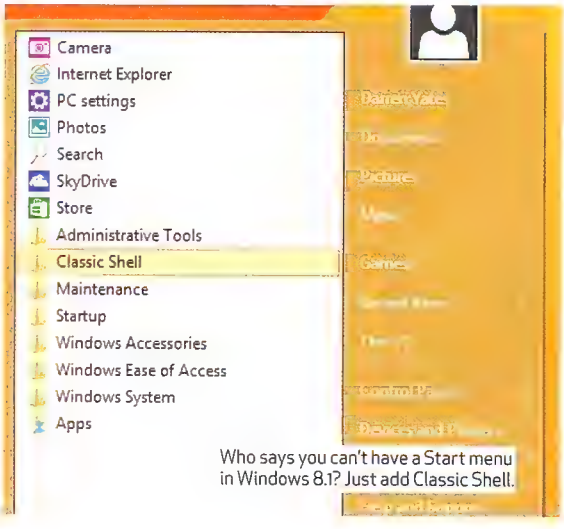
Additionally, if you don't want to see the Modern UI's corner navigation bars when you move your mouse to the top-left and top-right of the screen, make sure to check off the top two options under 'Corner Navigation' ('Show the charms' and 'Switch between recent apps'). Click the 'Apply' and 'OK' buttons and that should be the end of the Modern UI for you. Tick these boxes again to bring Modern UI navigation back if you wish.

STEP 2: INSTALL CLASSIC SHELL

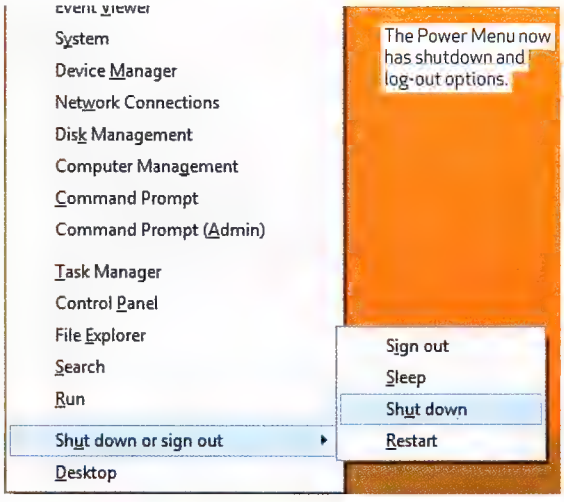
One thing Windows 8 did was spawn a whole new industry amongst software developers of creating Start button/menu replacement apps. We looked



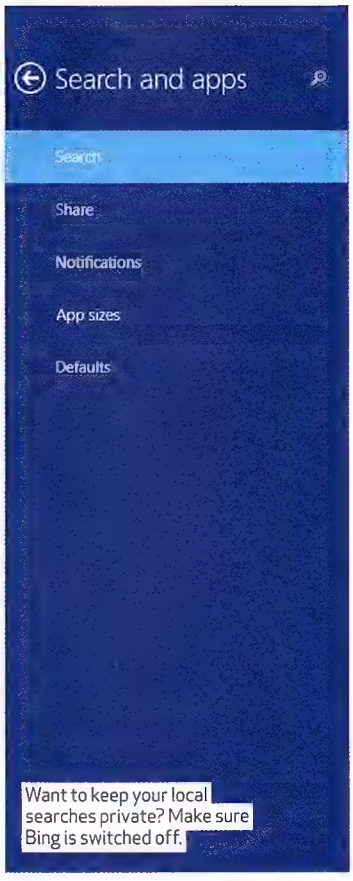
Boot to desktop, turn off corner navigation with new Taskbar properties.

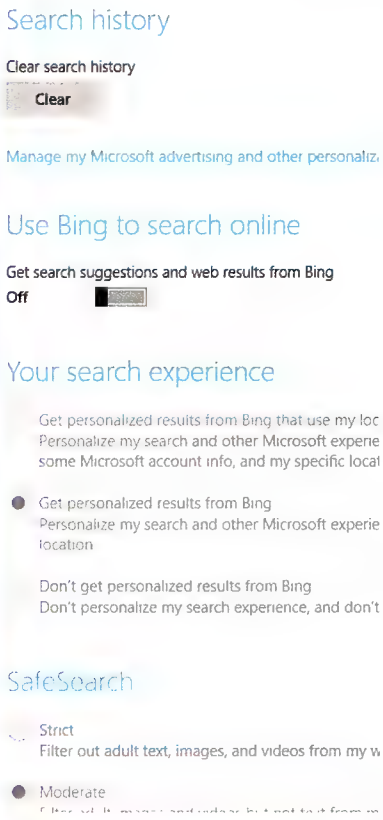


Who says you can't have a Start menu in Windows 8.1? Just add Classic Shell.



"Shutting down your system from within the Modern UI in Windows 8 is nothing short of painful."





number of these apps last month but to my mind, nothing beats the versatility (and price) of the freeware Classic Shell (**classicshell.net**). Install this app onto Windows 8.1 and not only will it recreate a very workable Start menu setup, it'll replace the default Start button too. The latest release candidate 3.9.5 now adds in a genuine Windows 7-style drop-down app Start menu. Combine this with 'boot to desktop' and it's as close to Windows 7 as Windows 8.1 will ever get.

WINDOWS 8.1 FOR POWER USERS

With essentially two user interfaces to play with, becoming a Windows 8.1 power user requires you to know some of the secrets of the OS to boost your efficiency. And the simplest of those is the Power Menu. It's your quick-access menu to much of Windows 8's back-room functionality, everything from the Control Panel to Device Manager and beyond. You can access it by right-clicking on the lower left corner of the screen, or by using the keyboard shortcut, 'Windows key'+X. But that's not all there is to being a Windows 8 expert – there are plenty of other features inside that are well worth knowing about. Here are just a few of our favourites:

QUICK SHUTDOWN

Shutting down your system from within the Modern UI in Windows 8 is nothing short of painful – you have to launch the Charms Bar, select 'Settings', right-click on 'Power' and choose 'Shut down'. What a mess. Now, you just hit the 'Windows key'+X, click on 'Shut down or sign out', choose 'Shut down' and you're done.

SHOW ALL DESKTOP APPS

By default, the new Windows 8.1 Start button simply shows the tiled Start screen. If you're happy with the tiled view, that's fine, but because of the way the tiles are organised, there's no easy way to differentiate between traditional desktop and Modern UI apps.

If you'd like to keep using Modern UI for your apps menu but would rather something a little more organised, you can get the Start button to activate the All Apps version of the Start screen, plus show the desktop apps first. It's easy to do – just follow the 'Boot to Desktop' step mentioned earlier, but this time, tick the boxes next to 'Show the Apps view automatically when I go to Start' and 'List desktop apps first in the Apps view'. Click the Apply button and the next time you press the Start button, you'll see all your apps, with desktop apps listed first.

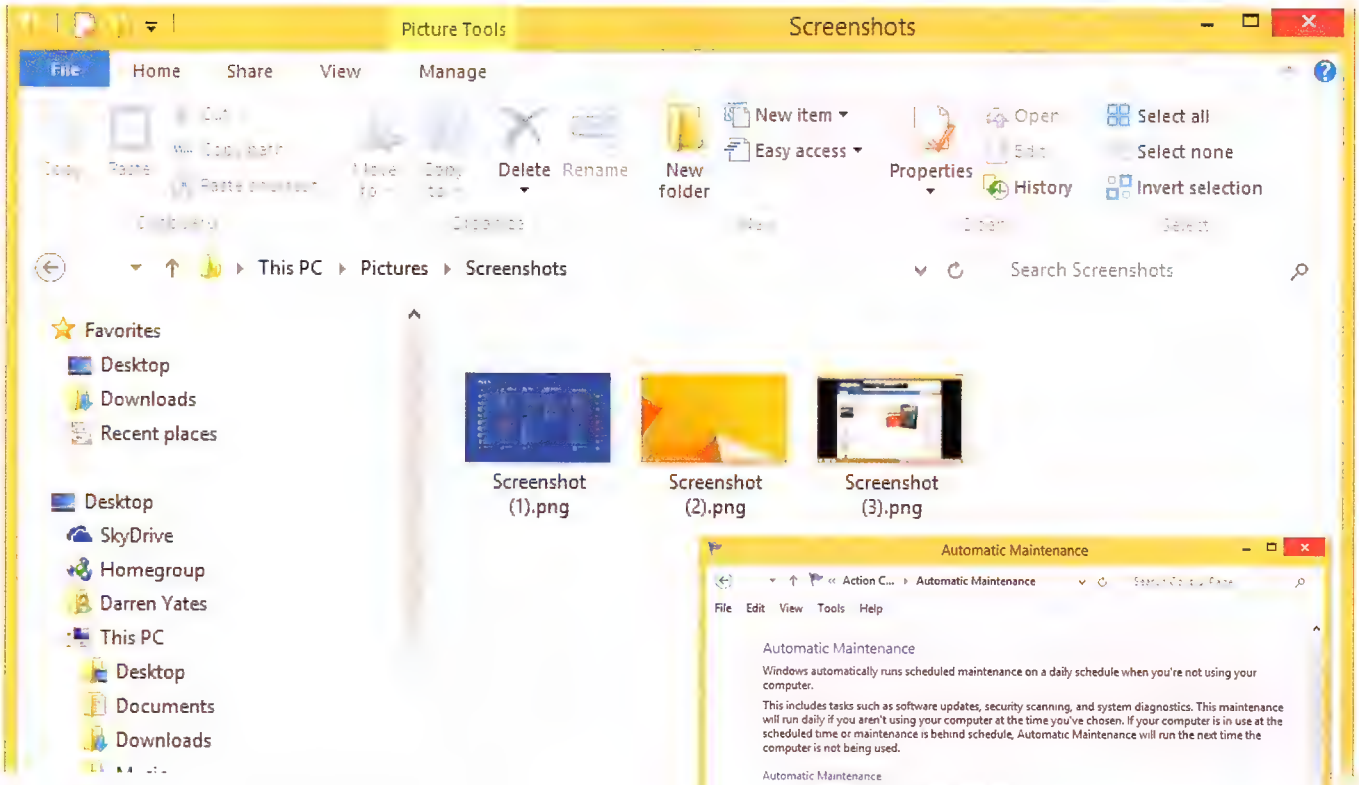
PROTECT YOUR SEARCHES

One feature of the Windows 8 Modern UI that few users seemed to like was the Search charm. However, while Microsoft has served up an improved 'Smart Search' in Windows 8.1, you'll want to make sure you check the settings before using it. Otherwise, not only will a local search include your local machine, it'll search the web also, plus reportedly send back your search query to Microsoft, attached with some of your account info for 'personalising'.

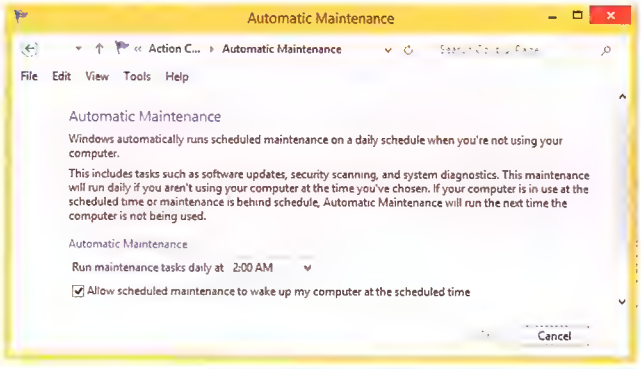
Microsoft is also expected to add targeted advertising to your searches at some point, which is enough for me to want Bing Search switched off. To do that, you need to fire up the Charms Bar, select 'Settings', choose 'Change PC settings', click on 'Search and Apps' and finally, make sure the slider switch under 'Use Bing to search online' is set to 'Off'.

TAKE SUPER-FAST SCREENSHOTS

You probably know that pressing the Print Screen button on your keyboard takes a screenshot and sends it to the clipboard. You may even know that holding down the Alt key and pressing 'Print Screen' will capture just the active window. But you may not know that Windows 8 has a



Use the Windows key-'Print Screen' shortcut to instantly capture a screenshot and save it as a PNG image.



Set Windows 8.1 to wake up at a set time to perform software updates.

super-fast screenshooter – hold the Windows key down and press 'Print Screen' to grab a screenshot and automatically save it as a numbered PNG file in your /Pictures/Screenshots folder. If you're using a Windows tablet, press the 'Windows key' and 'Volume down' buttons to get the same result.

ADVANCED TWEAKS

Windows 8 also offers plenty of advanced tweaks that are probably off the beaten path for beginners, but that allow you get into the depths of the OS and gain even more control over how it works and what it does. Here are a few we use:

MOUNT ISO IMAGES

As optical drives become less common, many of us are storing CDs and DVDs as ISO images, a single file format structure containing the data on the disc. The problem is that Windows 7 doesn't have any built-in way of looking at ISO images. Thankfully, Windows 8 does. Fire up Windows Explorer, right-click on an ISO image and choose 'Mount' from the menu. It'll now appear in its own window and you'll be able to access files as a virtual volume.

WAKE ON MAINTENANCE SCHEDULING

One of the most annoying features of Windows 7 is its penchant for wanting to install updates just when you want to shut down the machine and go home. The last thing you want to do is wait for who-knows-how-long while updates are installed.

But there's a smarter way – getting Windows to wake up your computer and automatically perform maintenance tasks such as software updates, security scans and the like at another time. Like during the night.

To set this up, you launch Control Panel > System and Security > Action Center, click the down arrow next to 'Maintenance'. Under 'Automatic Maintenance', click the 'Change Maintenance Settings' link. On the 'Automatic Maintenance' window, set your desired time and check the box next to 'Allow scheduled maintenance to wake up my computer'. Click the 'OK' button and you're done.

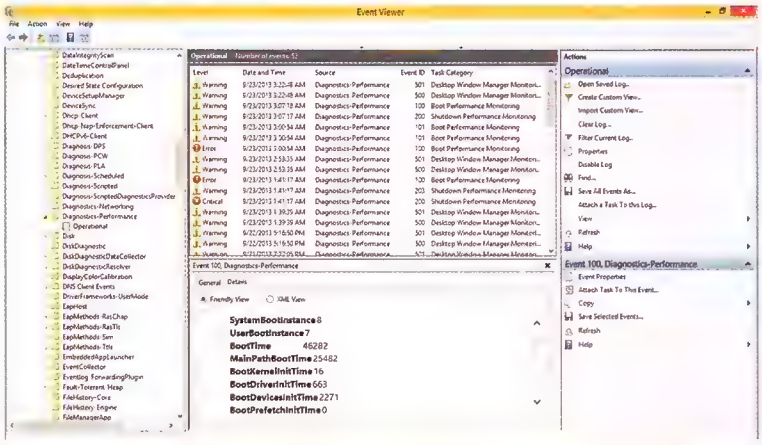
TRIM THE STARTUP APPS LIST

If you're like me, it doesn't take long before your desktop gets overloaded with apps. The problem is, the more apps you install, the more likely you'll get some of those apps helping themselves to your auto-start list. And the more auto-start apps you have, the longer it takes for your PC to boot up. Until now, Windows didn't ever tell you much about these apps, but Windows 8 does thanks to a new Task Manager applet.

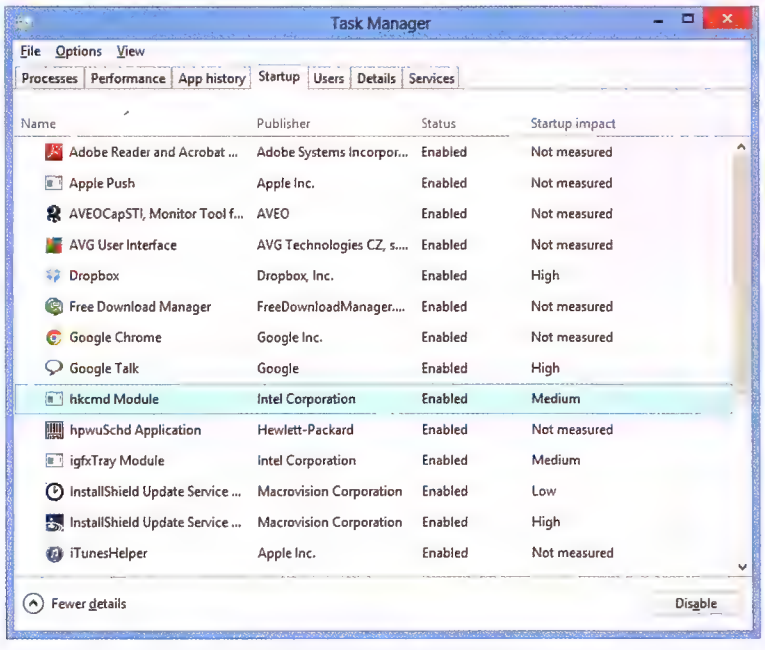
Hit the Ctrl+Alt+Del keys and select 'Task Manager' from the list. When it appears, click 'More Details' at the bottom of the window to bring up the advanced display. Click the 'Startup' tab and you'll see the list of apps. What's great about this list is that you also get a 'Startup Impact' measurement, which tells you which apps have a larger impact on boot time.

To stop an app from loading during startup, click on it and press the 'Disable' button. To re-enable, do the reverse, click on it and press the 'Enable' button.

"Windows 8 also offers plenty of advanced tweaks."



Use Event Viewer to find out accurate boot-up and shutdown times.



Use Task Manager's new Startup tab to turn off apps launching on boot.

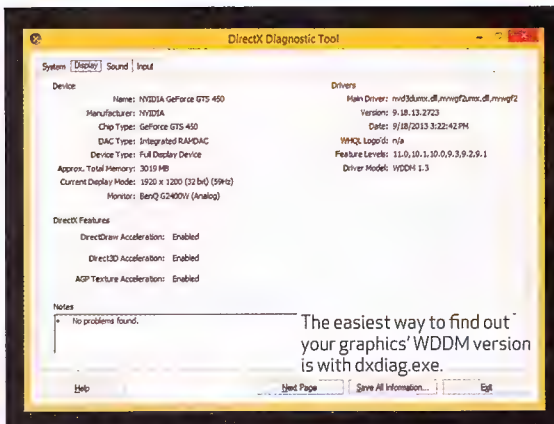
FIND BOOT AND SHUTDOWN TIMES

One of the areas Windows 8 makes some significant improvements is with boot-up and shutdown times. But unless you're eagle-eyed and quick as lightning on a stopwatch, getting accurate manual time records is near-on impossible. But if you use the Event Viewer, it's dead easy.

Launch the 'Power menu' and click 'Event Viewer'. When the viewer window appears, click on 'Applications and Services Logs' on the left-side panel, then Microsoft > Windows and click on 'Diagnostics – Performance and Operational'. You'll now see a whole list of events Windows has recorded. Look for event ID '100' for boot-up records ('200' for shutdown), click on the event and underneath, you'll see recorded 'Boot Duration' and a time in milliseconds (ms). Divide it by 1,000 to get the complete boot time in seconds from the time the computer finishes the POST (power-on self-test) and hands over to Windows to the time it finishes loading the last core module.

To find the boot time from POST to the Welcome screen, click on the 'Details' tab at the bottom half of the middle window and look for 'MainPathBootTime'. Again, it's in milliseconds, but it'll give you what you'd normally consider the 'boot time'.

Event Viewer and Windows logging works the same way here as it does in Windows 7, so it's a great way of being able to do 'A-B' comparison tests (and to test out how fast your SSD is, too).



The easiest way to find out your graphics' WDDM version is with dxdiag.exe.

Miracast screen-mirroring

If you want to take advantage of Windows 8.1's integrated Miracast support, be prepared for some initial troubleshooting because at the time of writing, this stuff is absolutely on the bleeding edge. This side of the official Windows 8.1 launch, there's surprisingly little information on Miracast support.

In broad terms, Miracast requires a certified source device paired to a certified display device before you'll see any screen mirroring, but it's not clear at this stage whether Windows 8.1 can be used as anything other than a source device.

The main problem on the source side for Windows is the need for a Windows Display Driver Model (WDDM) 1.3 video driver that includes Miracast support; for some reason, these are exceedingly rare. The only option at the time of testing said to work was for Intel HD Graphics 4000 or newer integrated graphics chips. Now, there are WDDM 1.3 drivers available for AMD Radeon HD 5000-series or later and Nvidia DirectX10-grade graphics cards, but these don't yet seem to support Miracast. The latest status of WDDM drivers available can be found at ***tinyurl.com/mn7xv5w***.

But even when you get that sorted, you also need a Wi-Fi adapter that supports Virtual Wi-Fi and Wi-Fi Direct, both of which are covered by the fairly-new Network Driver Interface Specification (NDIS) 6.3.

Next, on the target or 'display' side, you need a Miracast-certified display adapter. For this, we purchased a Netgear Push2TV PTV3000 display box ($78 from JB Hi-Fi), which we successfully pretested with our Samsung Galaxy S3 smartphone.

Unfortunately, despite our test PC having an Nvidia DirectX 10 graphics card using the latest qualified WDDM 1.3 (327.23) drivers, an 802.11n Wi-Fi adapter with NDIS 6.4, Windows 8.1 Pro and the Netgear PTV3000 display device (with latest 2.4.3 firmware), we couldn't get our PC to detect the Miracast display adapter. While Miracast has serious potential, we hope Microsoft sorts out a device compatibility list real quick.

To find out the NDIS version of your Wi-Fi adapter, launch the Power Menu, select 'Run', type `PowerShell` and hit enter. When the PowerShell window appears, type:

```
Get-NetAdapter | Select Name,
NdisVersion
```

And press 'Enter'. This will list the NDIS version. To work out the current WDDM version, fire up the Power Menu again, click 'Run' and launch `dxdiag.exe` (DirectX Diagnostic Tool). Click on the Display tab when the app appears, look over to the right in the Drivers groupbox for the Driver Model entry.

Netgear's Miracast-certified Push2TV PTV3000 wireless-HDMI box.

MAKE WINDOWS 8.1 GREAT ON DESKTOP

ASHTON MILLS DIGS UP THE ESSENTIAL EXTRAS THAT PLUG 8.1'S GAPS OR WORK BETTER THAN WHAT'S BUILT IN.

While Windows 8.1 brings a lot to the table (or in some cases *removes* from the table) it's clear there are still gaps that Microsoft either hasn't yet filled, or has no intention of filling. Naturally, third-party software and a little tweaking comes to the rescue, so here's our guide to the essential programs and tweaks for Windows 8.1 to make it a more complete, and compelling, OS.

STARTING WITH START

As we covered on page 42, Microsoft's response to re-implementing the Start button is a sad indictment of its approach to customers. Thankfully the products that launched – even before Windows 8 hit retail, thanks to the Preview builds – to restore the classic Start button and Start menu still work just fine with Windows 8.1 too. In fact demand is so high for this simple and effective feature that there are a wide selection of products to choose from (see our roundup, *APC* October, *page 74, Got Start?*).

Indeed, many of these go far beyond a basic Start menu and add a range of new features to super-charge your Windows experience. For free options look at Classic Shell (**www.classicshell.net**) or ViStart (**lee-soft.com/vistart**) as places to, well, start.

For paid products it's hard to go past Stardock's Start8 (**www.stardock.com**), which is perhaps the best overall solution available. While it isn't free, it is fairly easy on the wallet at US$4.99.

DVD PLAYBACK

DVD playback was one of the features removed in the transition from Windows 7 to Windows 8, and there's been no change when it comes to Windows 8.1. Arguably the best option here is the excellent and free Videolan Player (VLC) which you can grab from **www.videolan.org**,. It plays just about every format under the sun, and so also works as an excellent all-round media player for all your general video viewing pleasure as well.

If you really want to pay for your DVD support and stick with official channels, you need Microsoft's Windows Media Center upgrade. This is a paltry US$9.99 if you have Windows 8.1 Pro, but most people have (and only need) the standard Windows 8.1. So how much is the Windows Media Center upgrade for normal Windows 8.1? Well, there isn't such a thing – you first need to upgrade to Pro, which weighs in at a hefty US$99.99, and then you need to add the Media Center Upgrade on top. In other words, just forget Microsoft ever had DVD support in its OS and install VLC instead.

BLU-RAY PLAYBACK

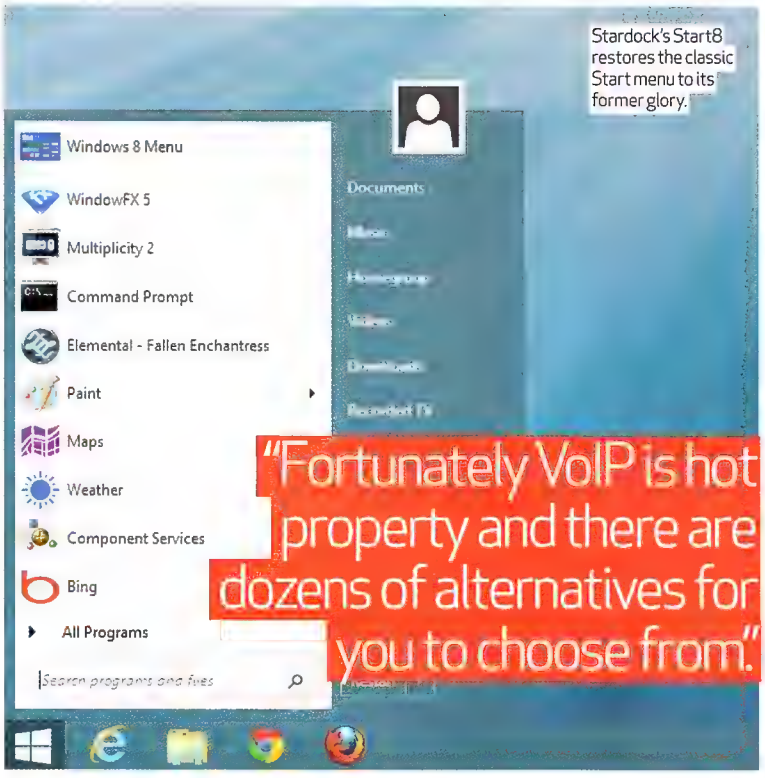
Blu-ray playback is a little tricker, given the license restrictions for the Blu-ray format. Here the best option for encrypted Blu-ray playback (aka, movies) is usually the Blu-ray playing software you should have received with your computer if it came with a Blu-ray drive. Drives are often sold with packages like Cyberlink PowerDVD (which, despite the name, also supports Blu-ray). If this isn't handy, you didn't receive it or you've lost the install disk, you can purchase commercial products, including Cyberlink PowerDVD (**www.cyberlink.com/powerdvd**), for between US$50 and US$100 depending on the feature set. Two other popular options here include Total Media Theatre (**www.arcsoft.com/totalmedia-theatre**) and Corel WinDVD Pro (**www.corel.com**).

There are some workarounds to using free players like VLC or PotPlayer if you prefer those, but they still require you to deccrypt the Blu-ray disk using a program like AnyDVD (**www.slysoft.com/en/anydvdhd.html**), which is a paid product due to licensing requirements.

MESSAGING

Windows 8.1 dumps the Modern UI Messaging app in favour of Skype. But what if you don't like Skype? The Edward Snowden leaks revealed, for example, that Microsoft not only worked with the US National Security Agency (NSA) to create back-doors in its software, but Skype has specifically been used to spy on video calls. Wonderful stuff eh?

Fortunately VoIP is hot property and there are dozens of alternatives for you to choose from, ranging



Stardock's Start8 restores the classic Start menu to its former glory.

"Fortunately VoIP is hot property and there are dozens of alternatives for you to choose from."

from extensions to common tools you might be familiar with such as with Google Voice (**www.google.com/voice**) and perhaps lesser-known alternatives like LINE (**line.naver.jp/en**) and Voxox (**www.voxox.com**), to more familiar options like ooVoo (**www.oovoo.com**), VSee (**vsee.com**), and the ever-popular Viber (**viber.com**). And to ensure you have a secure link with end-to-end encryption, check out ZFone (**zfoneproject.com**). In short, there's no reason to use Skype at all.

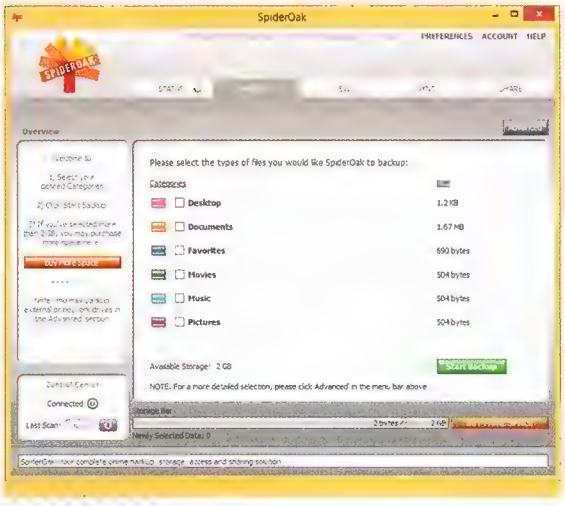
CLOUD STORAGE

Like Skype, SkyDrive has also been compromised by Microsoft for the NSA – your files are not safe from prying eyes on SkyDrive. And just like there's plenty of alternatives for VoIP software, so too is cloud storage a burgeoning industry, with a huge range of choices on offer. You can go with popular mainstays like Dropbox and Google Drive, or opt for more secure services like Box (**www.box.com**), Wuala (**wuala.com**) and Spideroak (**spideroak.com**). Spideroak, in particular, uses a key for encryption that only you know, meaning if you lose it even Spideroak can't recover your data: only you can access it, even when it's on Spideroak's servers. This is a far cry from the openly-compromised SkyDrive – again, if you're concerned about privacy, there's no reason you should be using Microsoft's default cloud service when there are much better, and genuinely secure, alternatives.

REPLACING THE WINDOWS EXPERIENCE

Another interesting omission in Windows 8.1 is the Windows Experience Index. Present since Windows Vista, the WMI provided an at-a-glance system overview that enabled non-techie users to see potential bottlenecks in system performance. And, because it was present in every copy of Windows, this made it extremely useful for comparison among systems without the need to install additional third-party benchmarking software.

Rumour has it that the WMI was removed due to poor results on mobile devices like tablets because, surprise, it's running on lower-end



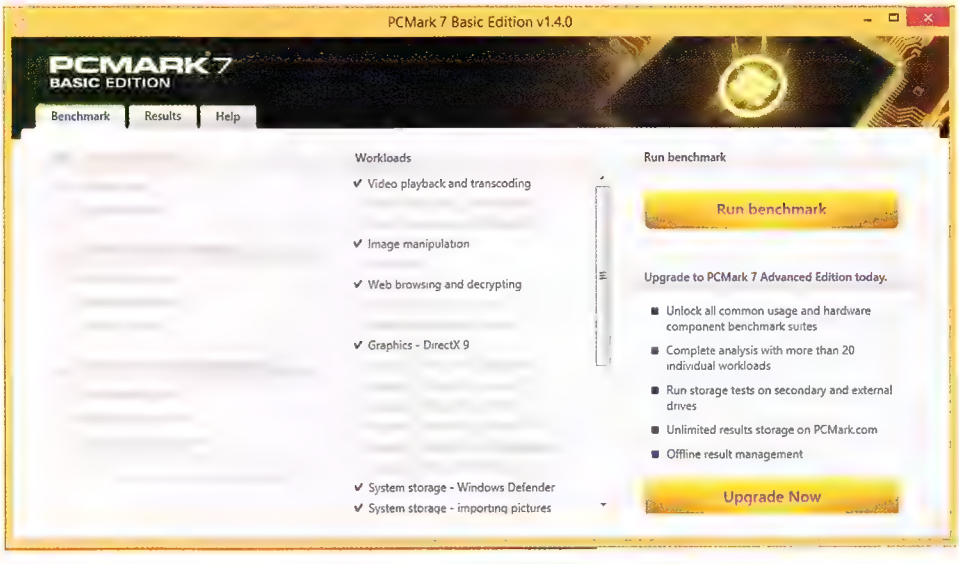
With SkyDrive compromised by the NSA, many users may prefer secure alternatives like Spideroak.

Now that the Windows Experience Index is no more, benchmarks like PCMark can be helpful to compare systems.

hardware – but a low score still looks like a low score, and this reflects badly on products like the Surface Pro.

There are of course *plenty* of alternatives to compare system performance, with a lot more depth than WMI enabled. If you're after a full system comparison, Futuremark's PCMark (**tinyurl.com/owcjzfw**) is perhaps the most well-known, but there are a plethora of benchmarks to test individual sub-systems such as 3DMark (**www.3dmark.com**) and Unigine Valley (**tinyurl.com/mqytfj8**) for GPU performance; CrystalDiskMark (**tinyurl.com/lfx5j6**) and AS-SSD (**www.alex-is.de**) for disk throughput; and to AIDA64 (**www.aida64.com**) and SiSoft Sandra (**www.sisoftware.net**) for memory and CPU benchmarks, among others. All are viable options, it just now necessitates installing the benchmark on any machines intended for comparison.

The Windows Experience Index may not have been the most comprehensive benchmark, but it



was good by virtue of its ubiquity, and we'll miss it.

USEFUL TWEAKS

AUTO SIGN-IN

If you're using Windows on a personal machine and want to avoid the hassle of signing in every time you boot up, you can enable this with a few steps – and if you have 'Boot to desktop' switched on, doing so will let you boot directly to the desktop without interruption. There's no default option to do this offered by Windows, but Microsoft does provide official instructions on how to enable it. Simply do the following:

- Tap Windows key+R to bring up the Run dialog box.
- Type in 'control userpasswords2' and hit 'Enter'.
- De-select the 'Users must enter a user name and password to use this computer' box, and hit 'Apply'.
- Enter the password for your account to confirm the action.
- Click OK and you're done!

ENFORCE CLASSIC DEFAULT PROGRAMS

You may have noticed that Windows 8 and 8.1 will automatically launch Modern UI apps for matching file types like images, videos, and music – which isn't very helpful when you're working on a desktop or laptop without touch.

Fortunately it's easy enough to redirect Windows to launch the classic desktop equivalent apps instead (such as Windows Photo Viewer for images, or Windows Media Player for video).

Enable this like so:

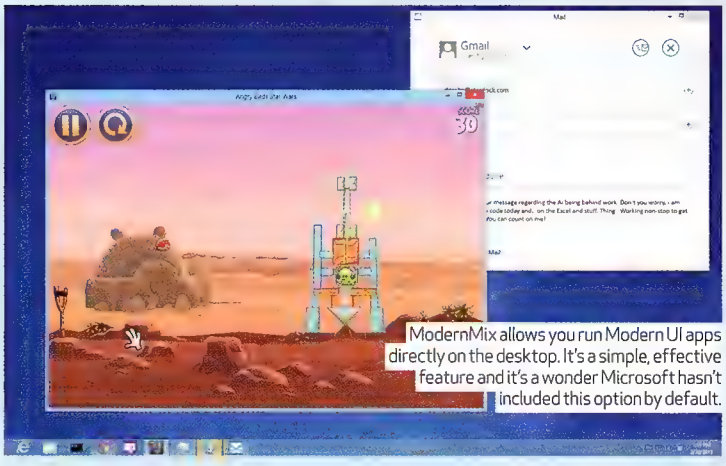
- Right-click on the new Start button and select Search.
- Type in 'default programs' and hit Enter.
- Click on 'Set your default programs'.
- To use the classic Windows image viewer click on 'Windows Photo Viewer' then 'Set this program as default'.
- To use the classic Windows Media Player, click on (no surprise) 'Windows Media Player' then 'Set this program as default'.

For each you'll see the number of total file associations linked to the program change after setting it as default. You can also do this with programs you install of course – for example, if you install Firefox or Chrome and want to ensure it becomes the default system browser for any links (so there are no surprise trips to the Modern UI version of Internet Explorer).

If you happen to be fond of IE, but prefer the desktop IE to be used over the Modern version for URL links, you can force the desktop version to be the default in a few simple steps:

- Tap Windows key+R to bring up the Run dialog box.
- Type in 'inetcpl.cpl' and hit 'Enter'.
- Click on the Programs tab.
- Under 'Choose how you open links' set to 'Always in Internet Explorer on the desktop'.
- Click 'OK'.

You'll notice there's also an option to force IE-based tiles to open on the desktop, too. ■



ModernMix allows you run Modern UI apps directly on the desktop. It's a simple, effective feature and it's a wonder Microsoft hasn't included this option by default.

One welcome feature in Windows 8.1 is the ability to go directly to the desktop mode at boot, and you can automate the login process too.

MODERN UI TOOLS

WE'VE FOCUSED PRIMARILY ON THE WINDOWS 8.1 DESKTOP HERE, BUT WE SUPPOSE THE MODERN UI COULD DO WITH SOME LOVE TOO.

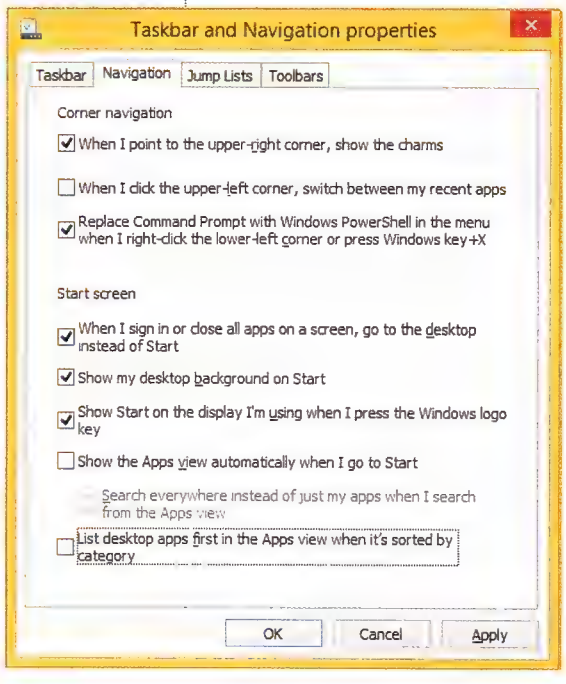
MODERNISE YOUR DESKTOP WITH MODERNMIX

First and foremost, you may be fond of some Modern UI apps, but don't necessarily want to switch to the Start view just to see them. Stardock comes to the rescue again here with ModernMix (**www.stardock.com/products/modernmix**). Also a US$4.99 program (as with Start8), ModernMix allows you to run Modern UI apps directly on the desktop, making it easy to always display the Weather app, News app and Calendar on your Windows 8.1 desktop view, for example. Even better, Modern UI apps can be pinned to the taskbar along with normal desktop Windows programs. It's a simple feature and we like it a lot.

MANAGE YOUR FILES IN MODERN UI

The other feature you might find lacking from the Modern UI is a file manager to do, well, file-managery stuff. Generally, Microsoft expects you to use Explorer to manipulate files, which automatically puts you into desktop mode. But what if you're using Windows 8.1 on a touch-enabled mobile device and want to more easily manage your files?

Enter Metro Commander, born before Microsoft was forced to change 'Metro' to 'Modern' to avoid litigation. Its title also appears to be a play on Midnight Commander, a popular file manager on Linux with a similar layout. And that's Metro Commander's strength — a clean interface to easily copy, cut, move, rename, delete and preview files and folders through the Modern UI at the touch of a finger (or two). It's free, though note that's due to it being sponsored by ads.



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Deep underground in the NSA HQ... "Has Dan Gardiner sent the latest issue of *APC*?", "No, he's been playing too much *GTA* again." "Typical."

It's grand to think that while we bake under the summer sun, we're all being kept safe by ASIO and the NSA recording every single communication we make, then stashing them in a five-zettabyte Utah-based storage facility for time immemorial? While President Obama says they're not, the head of the NSA says they are. Lurking between the legalese, it seems all voice and internet communications are being stored. But that's fine, isn't it? You didn't really want your privacy, now did you? Come on.

It might seem like *APC* has joined the tinfoil-hat wearing brigade. Yes, it's true that many of the team have food caches dotted around the Sydney area, but that's to fend off the munchies going to and from work, rather than planning for the apocalypse. Truth be told, we're somewhat less worried about the NSA running off with our emails – though surely that's an infringement of our intellectual property rights – than shady gents physically running off with our stuff, or even Russian hackers tapping their way into our systems.

Ever considered TOR? It's a clever system that masks your location by obfuscating your original IP address. Alongside this, it attempts to use HTTPS servers as much as possible to encrypt internet traffic, but it's not foolproof and is only relevant for your online life. What else you can do?

Put simply, you can either encrypt all your stuff or take it offline. We'll ignore that second option for the moment and concentrate on hiding all your stuff with encryption. Modern high-speed, high-security encryption not only protects your data, but is largely unbreakable when used correctly. You can deploy it to protect everything from your entire hard drive to individual emails sent over the insecure internet. We understand you might be busy and not paranoid, so we'll start by protecting the important stuff before moving on to encrypting selected emails or dealing with your full system...

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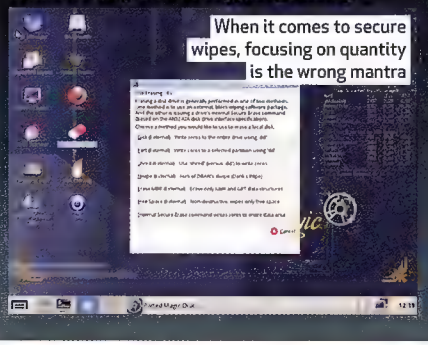
"If you want to protect your privacy you can encrypt all your stuff or take it offline"

Wipe it clean

THE BEST DEFENCE IS NOTHING TO DEFEND

As strong as encryption is, if you're getting rid of files, you'll want to dispose of them permanently. A cottage industry has built up around secure wipes over the years, but the truth is, their value has been largely oversold. While it's very true to say just pressing Shift+Delete doesn't erase the actual data — it just removes the file system's pointer to the data — the idea that multiple erase passes are required (never mind the ludicrous Gutmann 35 passes) just isn't true.



When it comes to secure wipes, focusing on quantity is the wrong mantra

All of this originally came from a paper published by Gutmann detailing safe erasure for 30-year old storage equipment, where a residual data remnant can remain. On modern hardware this simply isn't the case, as Gutmann details in a follow-up paper, saying a single wipe is perfectly effective on modern spinning hard drives.

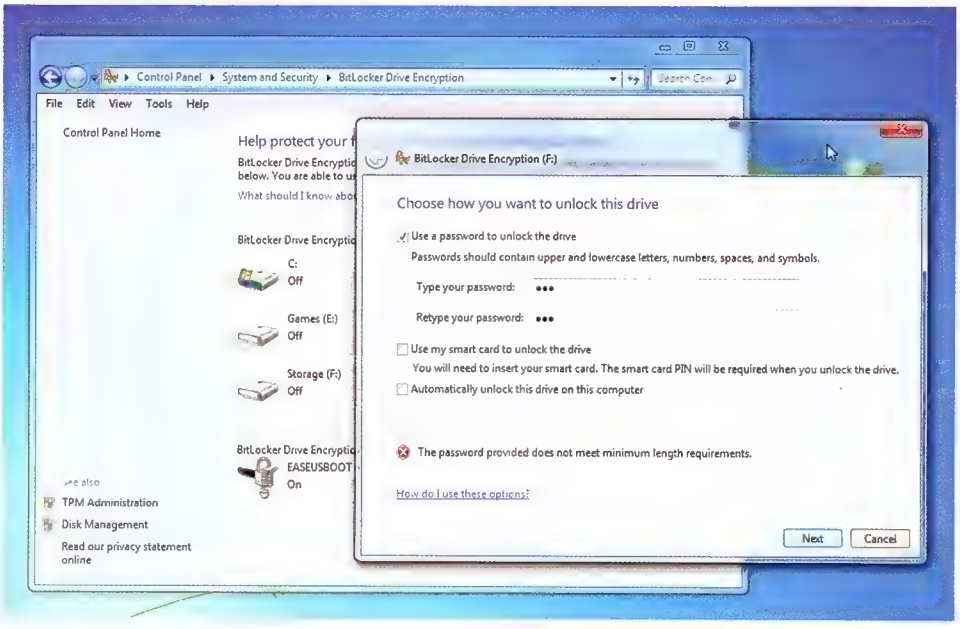
When it comes to SSDs, the situation is different again. You can't actually write a bit directly over a physical location, and the way SSDs work means you wouldn't want to do that anyway. Effectively you need to tell the SSD to reset all of its storage to a factory default. Not many secure erase programs support this, but we're going to suggest a wiping solution that works for both HDDs and SSDs.

The tool is Parted Magic (**www.partedmagic.com**). You'll want to download the 315MB ISO file and burn a bootable CD or DVD. Alternatively, use UNetbootin (**unetbootin.sourceforge.net**) to create a bootable USB drive from this same ISO file. When you boot from this, there's a number of boot options. The top one should suffice for systems with more than 1GB of memory. Once booted, use the Erase Disk tool and only select 'Internal secure erase' for SSDs.

We're glad you've made it this far, because frankly encryption is about as sexy as Tony Abbott gyrating in his budgie smugglers. It's also not helped by the usual set of questions. Isn't encryption a pain to use? Isn't it slow? Isn't it complicated to install? The short reply to these are no, no and no.

At its worst, we're talking about using an independent, open source, full-system with pre-boot encryption that requires you to create a password and rescue CD as part of a pretty standard installation. Beyond this, the encryption process can run in the background without hindering you at all. Thanks to modern processors being kitted out with accelerated instructions, deploying encryption on a system has almost no impact on performance. Even the impact on older systems is small at best — around a 3-8 per cent reduction on pre-2010 processors.

For newer processors, there's a set of hardware-accelerated instructions called AES-NI. Excluding Core i3 models, you'll find these in all Intel's processors since Sandy Bridge, but also in the Core i5/7 Clarkdale and Arrandale models, being the Core i5/7-6xx and i5-5xx ones. AMD has similarly integrated the instruction set into all Bulldozer, Piledriver and Jaguar processors. This increases performance at least five-fold, reducing the impact to just a percentage point at worst.



Most encryption will barely impact your PC.

One key design goal of the widely used AES was efficiency. On the Pentium Pro architecture, a byte can be processed in 18 clock cycles leading to 11MB/s at 200MHz. For hardware supporting AES-NI, this is reduced to just three clock cycles.

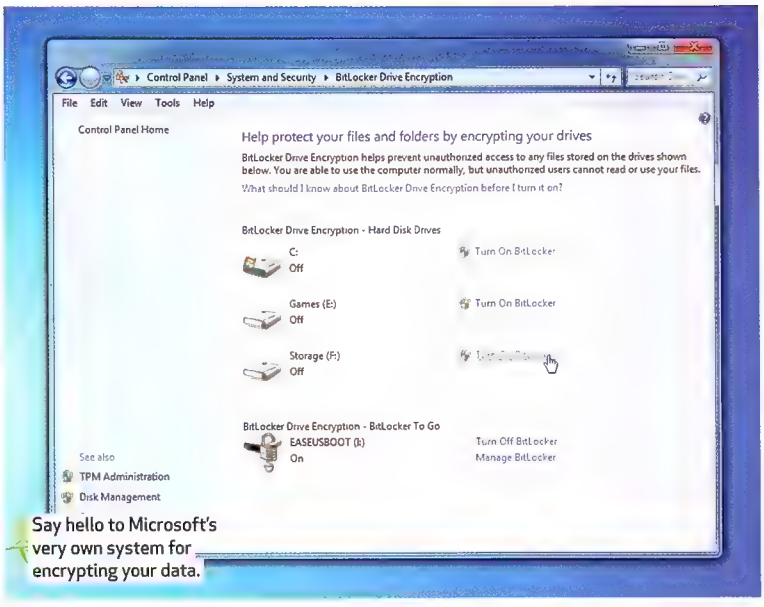
The practical outcome is that any mid-range or better system built in the last three years won't even bat an eyelid at full-system encryption. Outside of this level you can expect at least a 10 per cent reduction in drive access speed, but it's doubtful that would be across the board or more importantly if it'd be noticed by most average users.

LOCKED BITS

With performance worries neatly brushed under the rug, we can go back to wondering why we want encryption and how we can easily implement something useful.

The idea of encryption is to put up a barrier so complicated to vault, it's not worth the attacker's time to overcome it, but there's always a chance that they could discover the key or back door, or you might reveal the data by accident. It's therefore important to follow procedures when creating passwords and handling data — the classic gaffe being getting drunk and leaving an unencrypted copy of your data in a pub or on a train.

For protection we're going to look at a number of solutions that cover local files on specific drives,



Say hello to Microsoft's very own system for encrypting your data.

including removable drives, encryption of emails and files sent from your local machine, and full-system encryption of the boot drive. A number of the tools we've used here come with Windows, but we also turned to freely-available, open-source options that are just as secure, but run on most operating systems too.

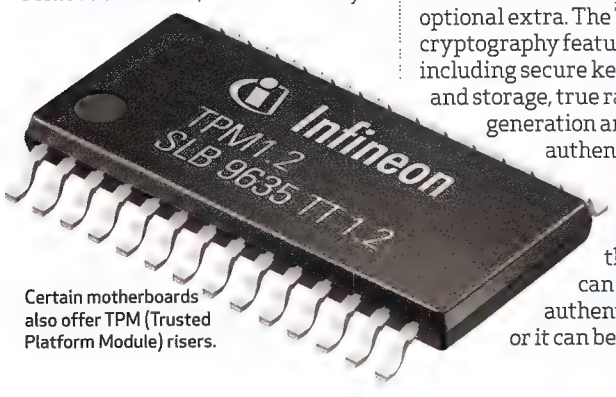
Let's kick things off by covering BitLocker, which is the official full-drive encryption system offered by Microsoft. The major limitation of BitLocker is that it's only available to the Enterprise and Ultimate Editions of Windows Vista and Windows 7, along with Windows 8 Pro and Enterprise Editions. It's something of a shame it's not available to all, because it offers a well-integrated and straightforward encryption system, but we guess Microsoft didn't want your average Joe securing their data then locking themselves out from it.

You can easily find BitLocker settings under the System and Security Control Panel. Just type BitLocker into the Start Menu (what do you mean Microsoft stole it?) and select 'BitLocker Drive Encryption'. For any drives other than the boot partition, including removable drives, there are really no restrictions; just activate BitLocker for that drive via the Control Panel.

BitLocker supports standard password protection and smartcard readers with a PIN, but for home use the latter option isn't likely. Just set a password that's at least eight characters long (which you should print and keep somewhere safe, just in case) and Windows will take care of the rest.

For the Windows boot drive, you'll need a spare inserted USB drive so that BitLocker can store the encryption key. Ideally you want a system kitted out with a Trusted Platform Module, as this takes care of all the boot-time key handling and authentication in total security. The extra complexity is required as the BitLocker system has to handle the boot-time transfer from the BIOS to a fully-encrypted Windows system. For a non-TPM system, it boots via the USB drive that stores the encryption keys and the code to swap the boot process to a much more secure partition.

We've mentioned the Trusted Platform Module (or TPM), but not really explained what it is. Much was made of it when it was first conceived, but it's most often found on business systems as an optional extra. The TPM provides cryptography features to the PC, including secure key generation and storage, true random number generation and system authentication.



Certain motherboards also offer TPM (Trusted Platform Module) risers.

As part of a secure ecosystem the TPM alone can be used to authenticate a system, or it can be used alongside

Public, private, perplexing

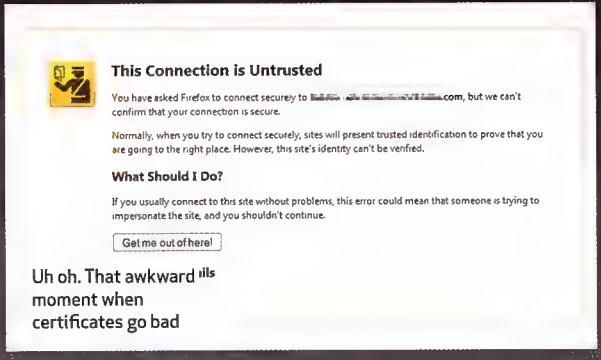
HOW DOES ENCRYPTION WORK ANYWAY?

Encryption is a term taken from cryptography, and in general is a technique used to turn a message into code and back again. For day-to-day computer use, encryption takes two general forms. The first is called symmetric key. You can think of this as a standard password, which is used to encrypt and decrypt the contents using an algorithm.

The second form is the somewhat more complex public key system. Public key systems can work in a number of ways; the most basic is the creation of a private key that's held by you, plus a public key that can be sent to and used by anyone else. A message is encrypted by the sender using the public key, and only your private key can decrypt it. An alternative use for this setup is using the public key to verify any message or file sent using the private key.

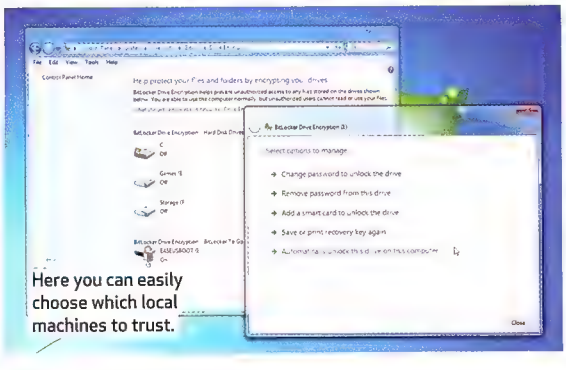
The major flaw here is that a rogue public key could be issued by a fake party, enabling that party to send you supposedly secret data. When it comes to web browsing with HTTPS encryption, a trusted independent third party must verify the supplied public key. If it finds an issue with the key, the browser displays a credential warning.

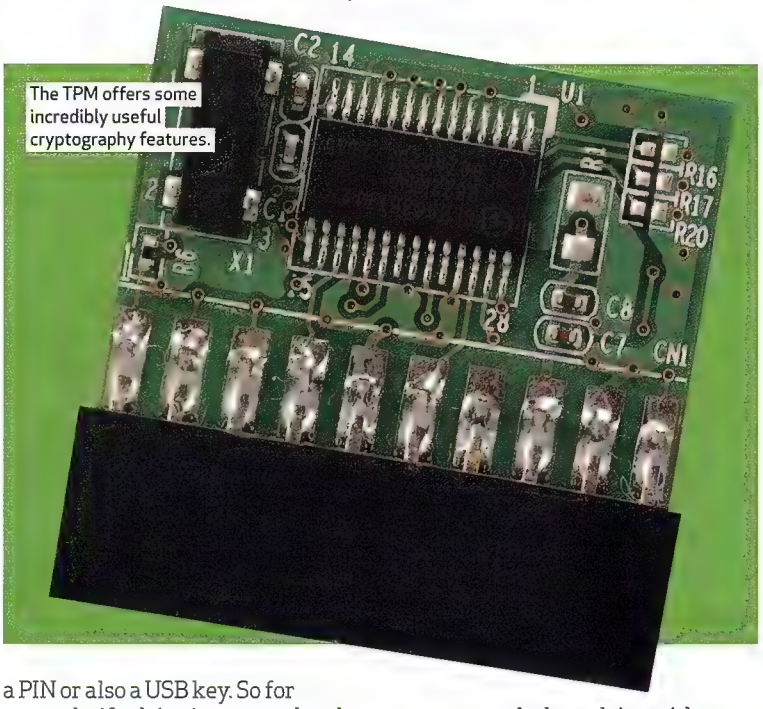
A more complex model is possible between two parties, if each has its own set of private and public keys. Each party can generate its own secret symmetric key by combining its own private key with the other's public key. This is called a Diffie-Hellman key exchange, and is important because it enables offline use.



Uh oh. That awkward moment when certificates go bad

"BitLocker is the official full-drive encryption system from Microsoft"


Here you can easily choose which local machines to trust.



The TPM offers some incredibly useful cryptography features.

a PIN or also a USB key. So for example, if a drive is removed and transferred to another PC, even with the PIN and with a USB key, the TPM won't decipher the data.

TRUE ENCRYPTION

In its hallmark style, Microsoft has made BitLocker as useless as possible by limiting its availability. Well done Microsoft. This isn't a problem though, because the open source community supplies arguably the best cross-platform, high-performance, full-system encryption solution around in the form of TrueCrypt. If you haven't already, go to **www.truecrypt.org**, grab the Windows install package.

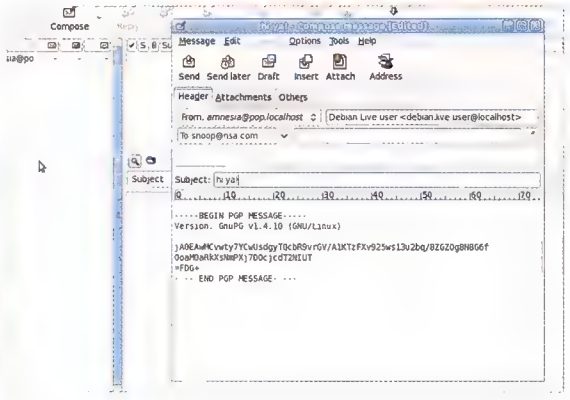
to encrypt the boot drive with a hidden system drive. For the super-paranoid, this last option creates two bootable systems with different passwords. If you're ever forced to provide the password, you can give the fake one. This triggers the system to boot into the 'fake' OS, and with the encryption, the real OS looks no different to random bits. For plausible deniability you're suppose to use the 'fake' OS on a day-to-day basis, saving the hidden OS for duties you want secure.

No matter what option you wish to use, click the 'Create volume' button and choose from file-base, non-system and system

"In true hallmark style, Microsoft has made BitLocker as useless as possible by limiting its availability"

You'll notice that the TrueCrypt interface is surprisingly simple. You can ignore the main area, which is a list of drives. This reflects an older aim of TrueCrypt: to provide a virtual mounted drive that's just a single encrypted file on the existing file system. It's clever, as you can read and write to it and the encryption is handled on the fly. You can still use this system, and it's a great way to carry protected data around with you on a USB drive. In fact, when you install TrueCrypt there's a portable option for exactly this.

Beyond this, TrueCrypt offers encryption of the system partition with boot-time protection, standard removable and fixed-drive encryption, and the ability



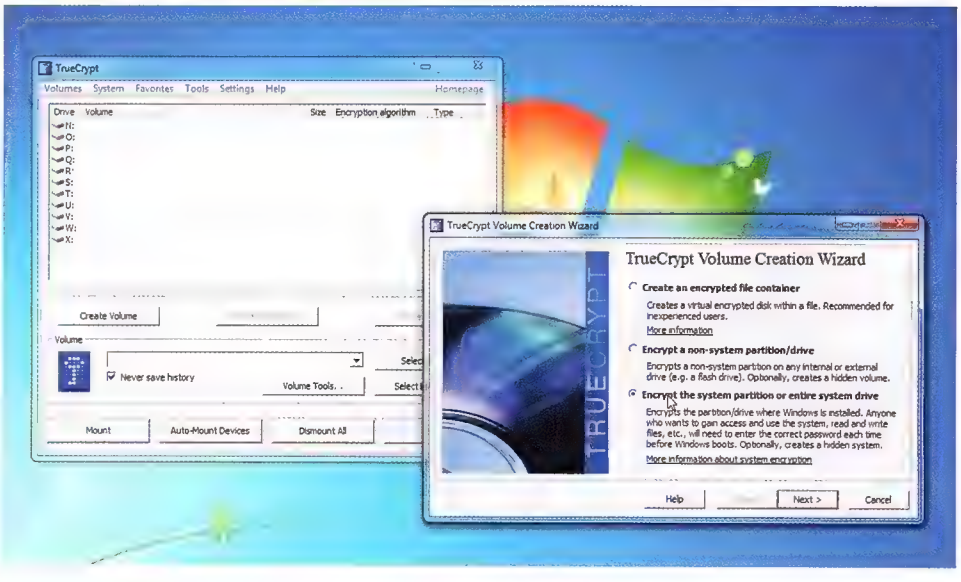
TOR uses a simple system to encrypt emails.

partition encryption. The system partition encryption is the most involved of these, but even this is straightforward. You'll be asked if you want a normal or hidden drive as detailed above. Most people, we suspect, will opt for normal.

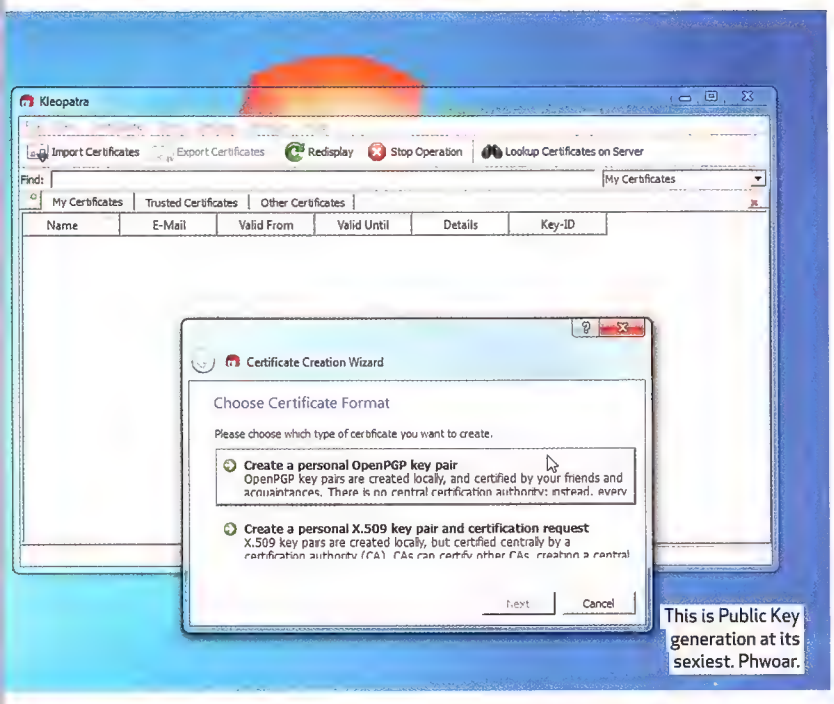
An option to encrypt the host protected area is next. If you built the system yourself, then you're safe to choose 'Yes', but for vendor systems we'd select 'No'. It depends on whether the PC has a hidden rescue partition, so if you're unsure, don't do it. TrueCrypt supports multi-boot systems, though if you're running one you can probably figure out this yourself.

Before creating your password, you can choose your encryption and hash methods. The default AES and RIPEMD-160 hash are perfectly adequate and securely tested solutions.

Finally, TrueCrypt will ask you to choose your very own password. This is very important stage in the process. As we've said before, a long, non-trivial password is best, and TrueCrypt suggest a minimum of 20 characters. We'd point to the XKCD guidelines of using multiple words that paint a memorable pictogram (**www.xkcd.com/936**), but it never hurts to top that off with a number and few bits of random punctuation. You need to remember this password, because there's no way to recover your data if you happen to forget it.



TrueCrpyt: security that's as good as it gets.



This is Public Key generation at its sexiest. Phwoar.

Next, TrueCrypt is going to create hashes and slats based on random data; it's already started to take 'random' data points. Computers are notoriously bad at generating truly random numbers, so it's been monitoring your key strokes, taken timing information and other elements. Next it'll ask you to move the mouse randomly too. With this done and the encryption keys created, it's essential that you make the rescue disc. In fact, TrueCrypt will not let you proceed without one.

The last stages including an option to wipe unused data. If you're using an SSD we don't advise this, because it's better to use the PartMagic and the three passes are really overkill. Finally, TrueCrupt will test to see if the system can in fact boot, and enable you to test the password. If all of that succeeds then it'll start the encryption, which takes place on the fly so you can carry on working.

EMAIL PROTECTION

With that all done, you have a secured system and the data can only be read if the correct password is supplied. For data files and disks, these can be swapped into any other system running TrueCrypt and continue to be used, as long as the password is supplied again. The rescue disk can not only decrypt all the data in an emergency but restore the bootloader, key data and original system loader, but you will still need your original password. You can also alter your password, but due to the way the encryption is designed, older rescue CDs will still be able to decrypt your data with the old password, so it's best to destroy it.

With the stuff on your hard drives locked down, it's time to turn our attentions to your stuff out there on the shady internet. Previously in *APC* we talked about TOR, which not only masks your IP but tries to use HTTPS as much as possible. But if your favourite online web email company is handing out access to your account, how can you keep your communication secure?

Enter PGP (Pretty Good Privacy), which is a public key system aimed at email. Now let's get one thing clear: if you're emailing people with web-based accounts, nothing is secure. However, if you encrypt your message or files locally before sending onto the internet, only the recipients you want will ever be able to read it.

While PGP is now commercially owned by Symantec the OpenPGP group maintains an open-source version, which is used as part of the **www.gpg4win.org** distribution. This clever pack bundles not only a full OpenPGP plug-in for Microsoft Outlook — if that's your email poison — but also Claws Mail, which is a standalone email client set up for sending encrypted emails.

Before you can use PGP, you need to create a key pair using the Kleopatra software. You'll be asked to supply your name, email address and a passphrase, which needs to adhere to the same security measures as a good password. Once this is done, there's an option to email your public key (called the certificate) to anyone who wants to send you a secure message. You can also use 'File > Export certificate' to get the public key file.

Of course, if you want to send someone a secure message you'll need to know their public key, so there's a level of cooperation required. If you use Microsoft Outlook, the plug-in found in the Add-in tab when writing an email will let you encrypt the message. ■

So, how secure is secure?

I'VE GOT A ROCK SOLID GPGPU FARM. SO JUST BRING IT ON... RIGHT?

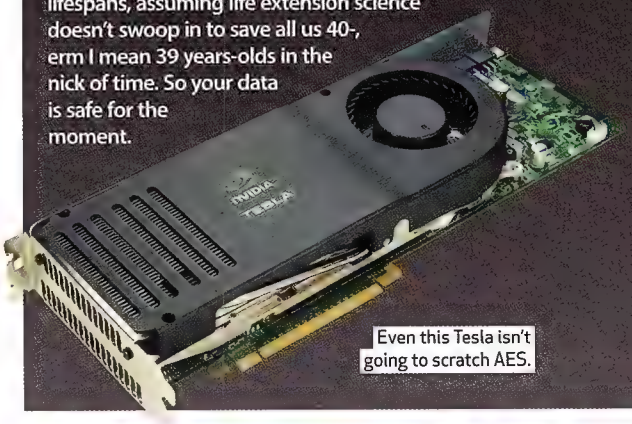
Standard encryption is usually based on AES (Advanced Encryption Standard), which the US military considers so secure, it's happy using it to store top secret documents. If you're wondering, AES is a symmetric key system, so the same key is used to encrypt and decrypt data.

AES puts data to be encrypted through a number of rounds of manipulation based on a 4x4 matrix, including byte replacement, cylindrical shifting, column mixing and finally key addition. That's after expanding the original key. This process is run multiple times – 14 for a 256-bit key, etc.

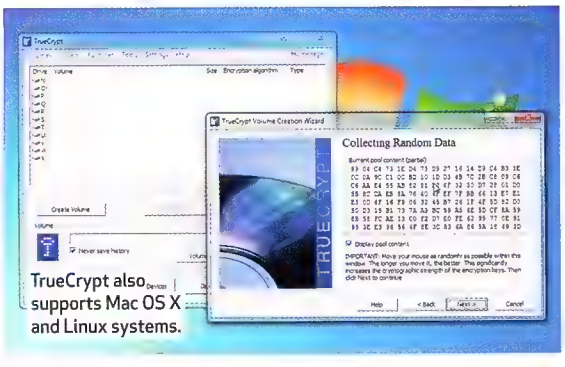
So far there have been no successful documented attacks on AES, which is better than a straight brute-force attack. With existing computer technology, it's assumed a brute-force attack would take almost as long as the heat-death of the universe, by which time hell will have frozen over. Even this calculation assumes current super-computer speeds will be available forever, with power to feed them.

As for quantum computing, the existing D-Wave quantum computer implementation can't be used for AES attacks because it doesn't work in the correct way. A 'true' qubit quantum computer can use an approach called Grover's algorithm, which halves the complexity. So an AES 256-bit cypher becomes as complex as an AES 128-bit. Running at super-computer speeds this would take around one billion billion years, so hell is still tropical, but as the sun engulfs the Earth in around seven billion years, you'd better get your skates on pretty sharpish.

With computing power doubling every two years, there's going to be a significant wait even for super-computer level systems to start worrying about AES 256-bit encryption. It'll certainly take longer than our lifespans, assuming life extension science doesn't swoop in to save all us 40-, erm I mean 39 years-olds in the nick of time. So your data is safe for the moment.



Even this Tesla isn't going to scratch AES.



TrueCrypt also supports Mac OS X and Linux systems.

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DISC CONTENTS

Issue 395 Nov 2013

Every issue, *APC* brings you a selection of exclusive full-version programs, entirely free. Here's what you'll find this month:

REVAMP YOUR PC

Speed up your hard drive the easy way with Abelssoft JetDrive Pro 6

Do you still remember the feeling when you bought your PC and everything ran so quickly? When applications opened almost instantly? With JetDrive you can regain this lost speed.

There is a physical reason why your PC slows down with time. The arrangement of files on your hard drive becomes more and more chaotic, and individual files may be broken into many small parts over the entire drive, resulting in fragmentation. The outcome is a slowing down of your system, as the hard drive reads and merges these separate fragments every time you open a file. JetDrive defragments your drive and restores it to an optimal state, defragments your registry with a specialised registry defragmentation algorithm and can detect and fix hard drive errors.

SYSTEM REQUIREMENTS

- A DVD-ROM reader or burner.
- The *APC* DVD is designed for use with up-to-date browsers (for example, Internet Explorer, Chrome, Firefox).
- The interface included on the *APC* DVD requires a JavaScript-enabled browser.
- An internet connection may be required for online registration of software before use.
- The software packages on the *APC* DVD have different system requirements. Software is included on the DVD for Windows XP, Vista, 7 and 8.

BEFORE INSTALLING

- Check the DVD using a virus scanner complete with the latest antivirus data updates. The DVD was checked before burning, but new viruses are being discovered all the time.
- Back up any important system and data files. It is not recommended that the software contained on these discs be installed on production machines.
- If you have any questions regarding the use of the *APC* DVD, click the 'Help' button at the top of the screen.

USING THE DISC

Insert the DVD into a DVD-ROM reader or burner and your web browser should automatically load the interface. If not, launch your web browser and load the default.html file from the root directory of the DVD.

MAC OS X AND LINUX

Launch your web browser and load the default.html file from the root directory of the DVD.

HELP

If you have any problems with the *APC* DVD, please visit *www.apcmag.com/dvd*. *APC* provides no technical support for this DVD or any software provided on it.

FULL VERSION WORTH $29!

DESIGN YOUR DREAM HOME

Professional 3D home planning software: **Ashampoo Home Designer Pro**

» Do you want to renovate, furnish or plan your dream home? Be your own architect and plan a project on your PC with Ashampoo Home Designer Pro. Get started now and build your dream home, plan your garden, furnish your living room or lay your favourite flooring. Ashampoo Home Designer Pro is a professional 3D planning program which you can plan and furnish a room, flat or even a whole house. For your project there is a wide range of elements available, as well as large catalogues with objects, materials and textures.

INCLUDES 32-BIT & 64-BIT VERSIONS

THE LIGHTWEIGHT LINUX

Streamlined Xfce edition of the world's #1 Linux OS: **Linux Mint 15**

» Linux Mint is a modern, elegant and comfortable OS which is powerful and easy to use. It works out of the box, with full multimedia support. Xfce is a lightweight desktop environment which aims to be fast and low on system resources, while still being visually appealing and user friendly. This Xfce edition of Linux Mint features all the improvements from the latest Linux Mint 15 release on top of an Xfce 4.10 desktop.

FULL VERSION WORTH $16!

ORGANISE YOUR CONTACTS

Easy contact management with **1-abc.net Personal Addresses 5**

» 1-abc.net is a streamlined contacts manager database tool. Based on the famous SQLite structure, this program organises all your contact data, saves changes automatically and is very easy to use. You can search for single entries using wild cards, switch between different address databases, encrypt your address data, export addresses to *.txt, *.csv or *.sqlite and print out contacts information.

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howto

» QUICK TIPS

Experts solve your computing problems

APC and its readers can be one giant helpdesk. If you have a technical problem, chances are one of us can solve it.

SECURITY

IN SEARCH OF A CLEANER INTERNET

I have several PCs and laptops at home, mainly running a few different versions of GNU/Linux. My daughter is coming up on six years old now and I need a more robust way of filtering the internet than the old 'just don't let her get online' system we have had up until now. Do you have any ideas for a simple whitelisting system that will work with my Linux machine?
Alastair Healy

At six, you only really need to worry about protecting them from their own idle curiosity. (Six-year-olds will stick their fingers in an electrical socket because they don't know what will happen. Twelve-year-olds will stick a fork in that same socket because they do.) If you want to roll your own whitelist, you can just add the sites you want, to etc/hosts and disable external DNS lookup on your router. You can also have a mixture of white and black listing if you want. If you list Facebook in etc/hosts as `0.0.0.0 facebook.com`, instead of `173.252.110.27 facebook.com`, then you can be sure the domain (and all of its subdomains) won't resolve to a valid IP address. Of course, you can still type in the numeric IP address directly if you know it, but it's unlikely six-year-olds will figure that out for themselves and it might even provide a handy back door if daddy needs some 'alone time' with certain sites. A more serious problem is that you also need to blacklist search engines because then kids can bypass DNS by just searching for stuff.

A much more robust internet filtering strategy is to move it into some cloud-based storage. OpenDNS (**www.opendns.com**) has a free FamilyShield service that maintains a comprehensive blacklist that's continuously updated and doesn't need you to install anything on your computers. You just configure your router to use its DNS servers and forget about it.

HARDWARE

TWO-SECOND BLACKOUTS

Whenever I play a video file in Media Player Classic or Windows Media Player, my monitor goes black for like two or more seconds — not every single time, but most of the time, very frustrating. I'm using the K-Lite Codec Mega Pack 9.9.0. My system specs are as follows: Windows 7 64-bit, ASUS Gene V, GeForce GTX 680 (320.49 driver), Samsung 27-inch LED S27A950D monitor with 120Hz refresh rate (using DVI connection). I also tried setting it all the way back to 60Hz but, alas, to no avail.
Eugene Strydom

Are you playing these videos full screen? If you play them windowed, does the entire monitor still black out, or just the media player window? What happens if you try playing them in VLC (**www.videolan.org**)? Just so you know, whatever else it might look like, this is a codec problem. You can reinstall graphics drivers and change video cables all night long, but it's not going to help. Your monitor is fine, your graphics card is fine and Windows is... well, mostly fine. You see, the trouble with video codecs is that they have a way of getting wedged into the tighter recesses of the operating system, so while theoretically reinstalling shouldn't fix anything at all, in practice sometimes it does, and so the problem gets blamed on an obscure Windows bug that Microsoft 'just refuses to fix'.

The same thing goes for the player application really. It's not a bug in media player — be it Classic or Windows — but sometimes the easiest way to eliminate a glitchy codec is to reinstall the player app completely, or to switch to a totally different one.

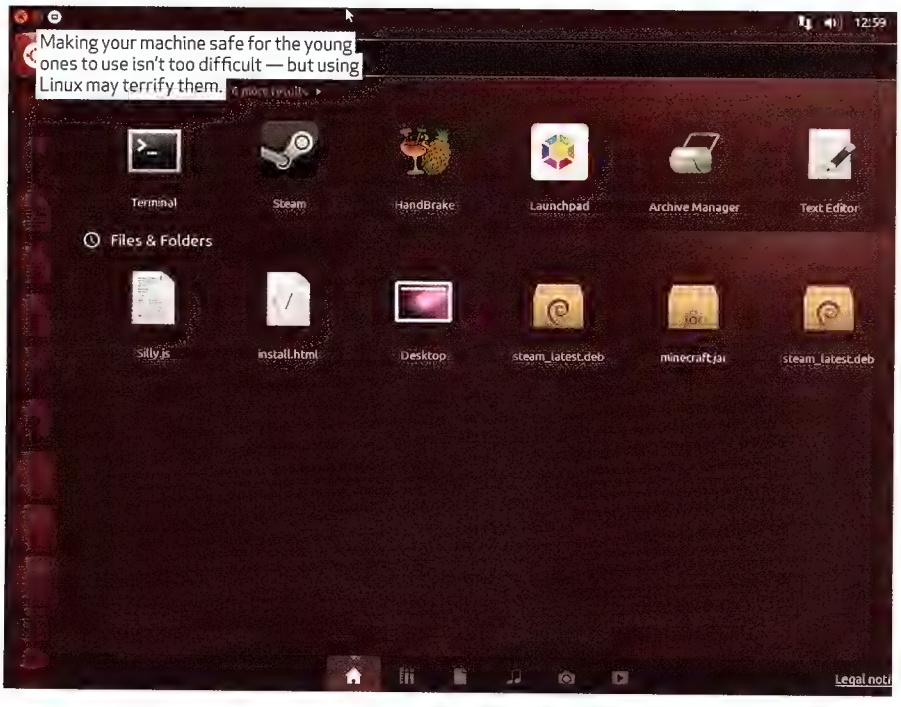
HARDWARE

MISSING DRIVERS?

I have a Windows XP computer at home with a HP Deskjet 5652 printer connected via one of my USB ports. I also have a computer with Windows 7 that's been networked to the Windows XP computer via a Netgear wireless network. With this setup in mind, I would like to share use of the printer with my other Windows XP computer.

The problem I have is that HP does not have Windows 7 compatible drivers for this particular printer. I can see the printer on the network, but receive an error message that the drivers could not be found when attempting to install the printer on the Windows 7 computer. I have been on the HP web site, and the HP Print and scan Doctor advises that I first connect the printer to the Windows 7 computer via USB and allow Windows 7 OS printer drivers to be installed. I have done this but I would like to know how I locate these drivers once I have reconnected the printer onto the Windows XP computer?
Grant Loubser

Unfortunately, HP doesn't have a downloadable Windows 7 driver for the 5652 because there's no need for one to exist. Windows 7 has drivers for this printer built in already. That's why connecting the printer directly to the



Windows 7 machine works – it just lets the OS know which printer you want so that it can go dig it out of the janitor's store cupboard at the back.

Once the driver is installed for a USB connected printer, you should be able to simply use the Add Printer wizard to create a networked printer definition using the same built-in driver. The wizard should find it automatically when it scans for networked printers, but if it doesn't, don't worry, you can browse for it manually, since you already said you can see the printer on the network.

Quad monitor set ups are largely seen in specialised business situations.

HARDWARE

COMPOUND VISION

I am hoping you can fish the fly out of the ointment of my perfect life. I have a four monitor setup (yes, I know I am borderline mad), arranged in a line. Monitor one is to the far left, then monitor three. My central and primary monitor is monitor two, and monitor four is on the right. Whenever an app creates a shortcut, it always appears at the top left-hand corner of monitor one, apparently ignoring primary monitor status. This disturbs my perfect life because I have to turn my head, then select and drag it across to monitor two.

In my quest to specify the target monitor for shortcut creation I have both Googled and approached the developer of DisplayFusion Pro, the multi-monitor application I use, but to no avail. Short of moving monitors one and three to the right of monitor two, is there anything that can be done to direct shortcut creation to the monitor of choice? Both the developer of DisplayFusion and I are holding our breath in anticipation.

Neil Hogg

Problems of this sort have been around since forever, whether you're just using Windows' native multi monitor support, or augmenting it with DisplayFusion or UltraMon. The fundamental issue is that Windows doesn't provide a very good framework for multiple monitors. It's a rare usage case to begin with, and almost nobody uses more than two monitors at once. The fraction of people who go balls to the wall with four monitors, like you, tend to have very personal ideas about what the 'correct' behaviour actually is.

I've managed to spend the better part of an hour today trawling through utilities that will automatically rearrange your desktop icons to see if there is something that might catch your errant shortcuts and redirect them to the relative safety of your primary monitor. There are a lot of them to choose from, most of which were written before 2009, and sadly there aren't any that I'd heartily recommend for your beloved machine. What it comes down to is this: how often do you actually create a new desktop shortcut anyway?

Is it worth going to the trouble of installing another memory resident application (probably written in Visual Basic by a hobby programmer), just to save you the trouble of dragging one icon across your screens when you install a new program or game? That'd be getting rid of the fly in your ointment by replacing it with a big, hairy spider.

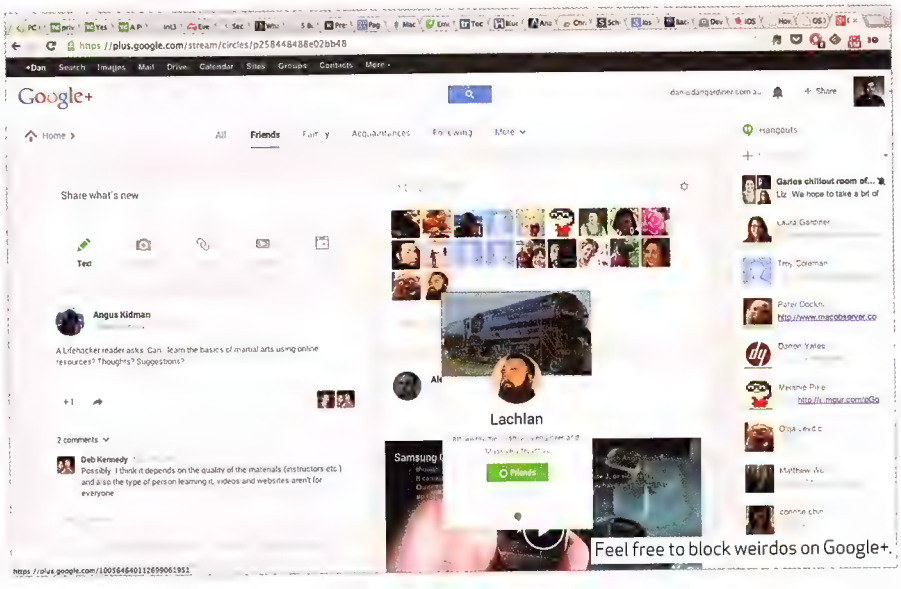
SOCIAL NETWORKING

SILENTLY SNUBBING SOMEONE

I have an issue with a work colleague who is trying to intrude on my personal space out of work hours via Google Hangouts and Google+. Is there a way I can block them, but make it look like it is some kind of technical problem at his end? I want him to give up and leave me alone, but I would rather not make it seem like a direct snub, if you know what I mean?

Name withheld

Sadly, technology can't solve this one for you. If this is an 'office space' thing, with a boss who is "gonna need you to go ahead and come in on Saturday, mkay" you could get a new job or you could opt to just suck it up (I mean that metaphorically). If it's some creeper trying to ask you out (or worse), you need to be polite but firm with them. Google Chat didn't invent these problems and it won't get rid of them either. I would suggest certainly blocking this guy, because in either of the scenarios above, you are quite within your rights to do so, but if he calls you out on it, be ready to look him in the eye and tell them why you decided to block him in the first place.



Feel free to block weirdos on Google+.

Downloading files to your SSD shouldn't wear it out any faster, but it won't make downloads any quicker.

Is there a risk of heavy PC components damaging your motherboard?

HARDWARE

AM3+ ON MY AM3 MOTHERBOARD?

Will my aging AM3 board (Asus M4A77D) play nice with an AM3+ FX-8350 (Vishera 4GHz, eight-core)? I've read that although it is an unsupported configuration, it can work.
Paul de Campo

Don't try it. We aren't sure where you read that it works, but we wouldn't recommend it. Some ASUS AM3 boards can be updated to AM3+ via a BIOS update, but your mobo isn't one of them. The BIOS for the M4A77D hasn't been updated since 2010, and your board doesn't support 6Gbps SATA or DDR3. The chip may work and the box may POST but the experience can be wonky when the CPU is not supported by the BIOS. We recommend that you do a board upgrade, as well, if you intend to run a Vishera.

INTERNET

DOWNLOADING: SSD OR HARD DRIVE?

I could use some advice on torrents. Whether I am downloading them or uploading them, I'm constantly reading and/or writing data from my storage. Would it be better to keep torrent files on the SSD or the HDD? I believed that an SSD would be the best option, but a friend said a hard drive would be best for such a job. My friend also mentioned that SSDs have shorter life spans than hard drives, which is all the more reason to use an HDD. Is this true as well?
Alex Lee

Your friend is right – kind of. If you're downloading a lot of torrents, you're writing many gigabytes of data, in many small chunks, in an application where drive speed is not relevant. Your torrent download and upload rates are limited by your network speeds and those of your peers, not the speed of your drive.

A hard drive has a lot more storage for the dollar. You can get a 4TB hard drive for less than the price of a 256GB SSD.

Endurance of SSDs is really a canard at this point. They do technically have a shorter life but to wear out an SSD would take so much data that it's highly unlikely a person would ever hit that threshold. The controller would likely quit before the NAND would – but you'd never download enough torrents to find that out, because either your ISP would cut you off or a 'Flowers By Irene' truck would roll up to your house before you could reach that point. Still, given the price of hard drives today and their mammoth capacities, it makes a lot more sense to just store those Linux distros you're downloading on a hard drive. Save your SSD's capacity for your OS, programs, and games – where their relative speed can shine.

HARDWARE

TOO BIG?

In some of your PC building/overclocking articles you've indicated that using a third-party, aftermarket CPU cooler is a good idea. I have always had a concern about cooler and fan weight damaging the motherboard. I build in mid- or full-tower cases and it seems that having so much weight hanging from the motherboard risks damage. Is this a valid concern? I would probably use one of the Thermalright coolers designed for an AMD FX-series CPU.
Rich T.

The bigger aftermarket coolers can weigh upward of a kilo, so it's not impossible for a heavy cooler to damage your motherboard. This is why modern CPU heatsinks now have solid backplates that you install on the other side of the motherboard, that distribute weight and help prevent damage to your board. As long as your cooler fits in your case and is installed correctly, it shouldn't damage your motherboard in the course of normal operation. That said, don't go knocking over your computer. If you're shipping your machine, or travelling with it (for example, going to a LAN party or moving across town/state/country), it's a good idea to remove your CPU cooler, graphics cards, and hard drives and package them separately. Otherwise, if they get loose or torque, they can damage themselves or your motherboard.

HAIR LOSS

PC MAKING ME GO BALD

My PC display freezes randomly (like pausing a DVD player) and I have to manually shut down my machine. Drivers are up to date, nothing shows up in error reports, no luck with any Windows troubleshooting, etc. I'm hoping you might be able to point me in a direction to look. I'm about ready to pull my hair out! I have a Core 2 Duo Q6700, MSI G41M-P34 motherboard, MSI N550GTX Ti graphics card, 8GB G.Skill DDR3-1066, and 64-bit Windows 7 Home Premium.
Tom Zeis

Try uninstalling the Nvidia drivers and reinstalling the latest drivers for your GPU from **GeForce.com**. You can use the 'Auto-detect your GPU' option at **www.geforce.com/drivers** to make sure you're getting the right ones. Be absolutely sure you've uninstalled any existing drivers first though.

If the problem persists, it could still be your video card, but it might also be the RAM. Download Memtest86 from **www.memtest.org**, make a bootable CD or USB, and run it overnight to check your RAM for errors.

If there's nothing wrong with your memory, it could be a problem with your video card itself, or a problem with your connection. Shut down and unplug your computer, open up the case, and remove the graphics card. Make sure the fan isn't

clogged with dust, and that there isn't dust in the PCIe slot or on the card's PCIe connector, then carefully reinstall the card.

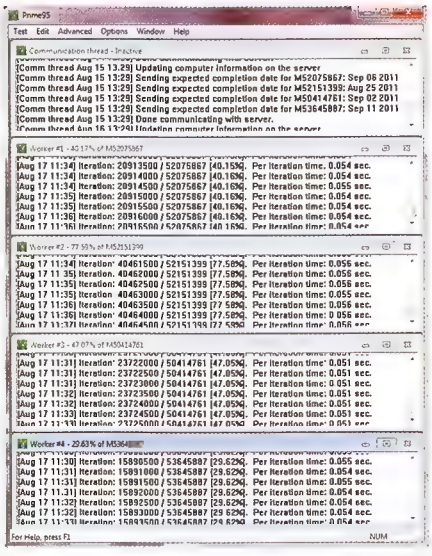
If that doesn't work, you can try uninstalling the Nvidia drivers, downloading the Intel integrated drivers from MSI's web site, removing your GPU, and setting your computer to use the integrated graphics instead. If the problem goes away, it was definitely your video card. If the problem persists, it's probably your motherboard.

One last thing – this is dumb, but make sure your monitor cable is plugged into your GPU's video ports when you're using your GPU, not the ports from your motherboard.

WINDOWS
FILE EXTENSION BLUES

I have a strange problem in Windows 7. It relates to a file association. At least, I think it does. I use a program called DVDFab (great program, BTW), and when it starts and there's an update available it asks if I want the update. When I click 'yes' it doesn't take me to the site but instead opens my HTML editor. This happens with any program that asks to update. I can't figure out where to change the association. Can you help?
Carla

It sounds like Windows is configured to open certain web extensions in your HTML editor rather than your browser. For example, Windows treats .htm and .html as separate file types and allows you to assign different default programs to each extension. Next time it happens, make a note of the file extension of the page your HTML editor opens. Then go to Control Panel and select 'Programs'. Under the Default Programs heading, select 'Make a file type always open in a specific program.' Scroll down until you find the file extension you're looking for, and double-click it. Choose your web browser from the list of options that pops up, and you should be all set.



Prime95 is a great tool for testing system stability, especially if you're overclocking.

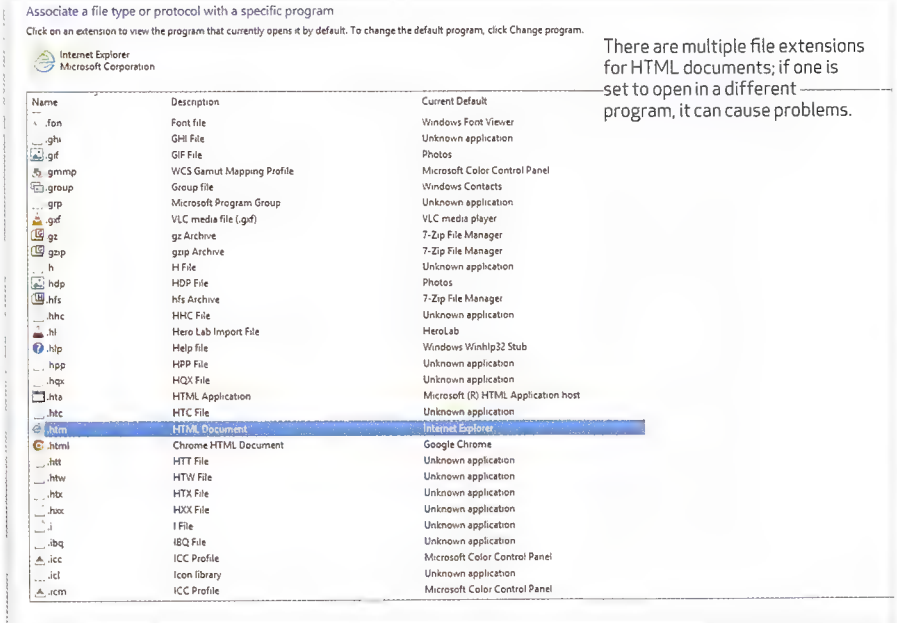
WINDOWS
DELETING WINDOWS AFTER INSTALLING CHROMIUM

To free up disk space, I want to remove my previous Windows Vista installation on an old PC after installing Google Chromium Vanilla. How do I do this?
Sonny Starks

Have you already installed Chromium Vanilla into a separate partition, or are you planning to install it, and then remove Vista afterwards?

If you haven't yet installed it, you should know that you can choose to install Chromium Vanilla so that it dual-boots with your existing OS, or install it as the only OS, in which case it will overwrite your Vista partition during the install process.

If you have already installed Chromium alongside Vista, you have two choices: Delete the Windows partition manually with a partition manager, then expand the Chromium partition to take up the newly freed space, or just reinstall Chromium Vanilla and choose the option that makes it your only OS. Since the whole point of Chromium is to act as a mostly cloud-based OS with everything synced to your Google account, you shouldn't lose any data, and it'll be easier than messing around with a partition manager.



There are multiple file extensions for HTML documents; if one is set to open in a different program, it can cause problems.

BENCHMARKING
GETTING READY FOR PRIME95 TIME

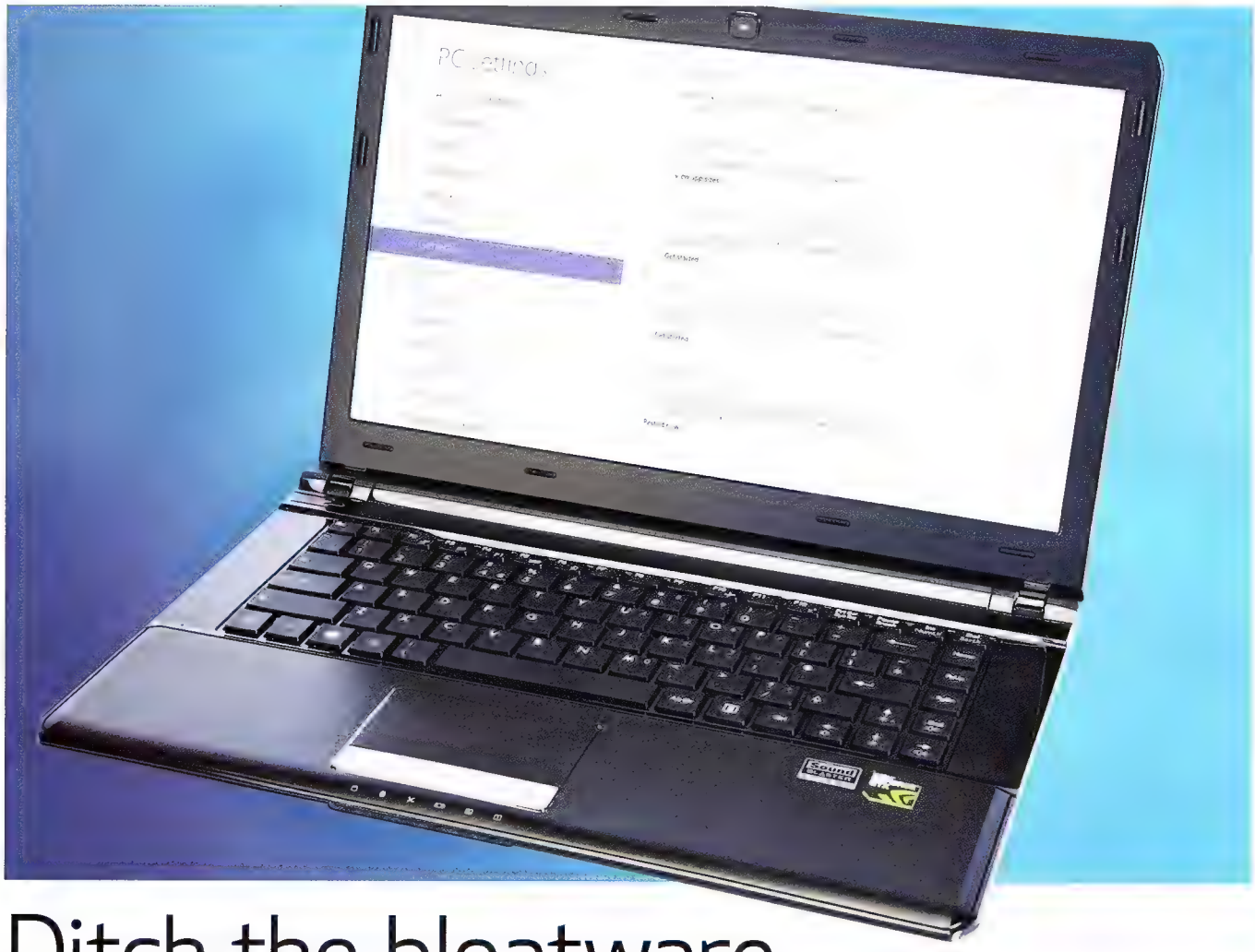
When running Prime95, do I need to make any changes in the cooling system? I'm using the Corsair H100i. My system is based on the Performance Build in the October 2012 issue, with a few changes such as the CPU cooler. The case is a HAF 932 Advanced, and the PSU is a Cooler Master 850W Silent Pro. Everything else is the same.
James K Gillette

We mostly use Prime95 to make sure our CPUs are stable with the clock speeds, voltages, and cooling choices we've selected. The only reason you might need to change your cooling system is if your CPU frequency is throttling due to high temperatures (usually above 90 C) when you run Prime95. And you'll find that out soon enough.

HARDWARE
TRADING IVY BRIDGE FOR SANDY BRIDGE-E

I have a gaming rig with a Core i5-3570K, 16GB of RAM, an EVGA GTX 660 SC, and a 750W PSU. I'm pretty happy with all my hardware, but I'm considering upgrading to Socket LGA2011. I just can't decide if it's really worth upgrading if I'm mostly using the rig for gaming. If it is, should I grab an Ivy Bridge-E when they come out or grab a Sandy Bridge-E when they drop in price?
Jesse Pearce

Don't get caught on the upgrade treadmill; switching sockets is not worth it for a gaming rig. You have a fantastic unlocked quad-core Ivy Bridge CPU that's more than enough for any game you're going to play for the next four years, plenty of RAM, and a decent video card. If you really want to upgrade your rig for gaming, take the money you would spend on replacing your CPU and motherboard and put it into a second GTX 660 SC. Doubling up on your GPU will give you roughly twice the graphics performance for around $225. The Sandy Bridge-E Core i7-3820 CPU, which is only slightly better than your existing i5-3570K, is $300, and that's before you buy the motherboard. A GPU upgrade is your best bet. If you don't have an SSD for your OS and games, consider one of those, as well. Also, Sandy Bridge-E isn't likely to see much of a price drop when Ivy Bridge-E comes out, as Intel is pretty good at running down inventories to prevent overlap.



Ditch the bloatware

Dave James learns to love the Windows 8 command line with the refreshing recimg tool.

YOU'LL NEED THIS

Windows 8

Refreshing your installation is only available from Windows 8 onwards, but if you have that installed as your OS then that's all you need. Well, the OS, some time and a little extra space.

One of the neat things about Windows 8 is the ability to effectively do a factory reset on your trusty PC. Like the mobile operating systems we've become used to with our smartphones, sometimes you just need to start over. Windows 8 offers two different options for this: first is the reset option and the second is refresh.

Resetting your Windows 8 system will delete all your data and essentially return the system to its original state (as it would be if you'd carried out a completely fresh install from the disk). That's just dandy if you want to clean out your machine before passing it on, but not so helpful if you're planning on using the rig again yourself – this is where the rather handy refresh option comes in. Out of the box, refresh offers the option to keep hold of all your data and your Modern UI applications, but refreshes the system files around them – it's also a course of action that might just improve the speed of your machine if things aren't running so smoothly any more.

What it doesn't do in its default state is keep hold of any of your desktop applications. This is where recimg.exe comes in handy, allowing you to create your own refresh state, replete with whatever desktop applications you want to start with. That means you get a new Windows 8 machine refreshed to your ideal state, with your apps ready to use.

We've found it particularly handy for laptops, especially those whose manufacturers have installed a painful amount of bloatware, such as 'free' games, eBay links and unnecessary programs which do little more than chew up valuable resources. It's the same situation with updates; already Windows 8 requires a lot of updating on a fresh install since, at time of printing, we're still waiting on the release of the 8.1 service pack. Once you're all up to date, have uninstalled the programs you don't want and installed the ones you absolutely have to have, then use recimg.exe to give yourself a custom refresh point.

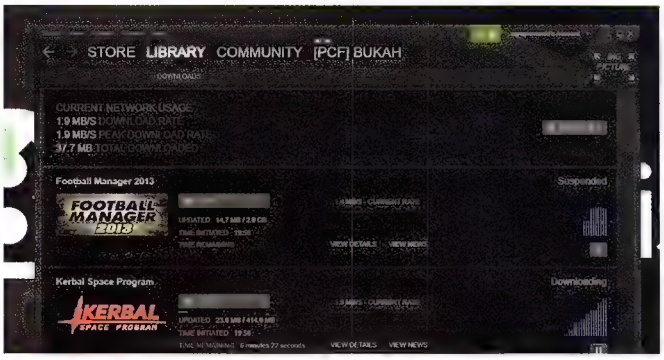
TOP TIPS

VALIDATE THOSE FILES

Some Steam games, like *Kerbal*, will work straight away. Others, like *Football Manager*, will require you to validate the installed files before it will launch again for the first time, post-refresh.

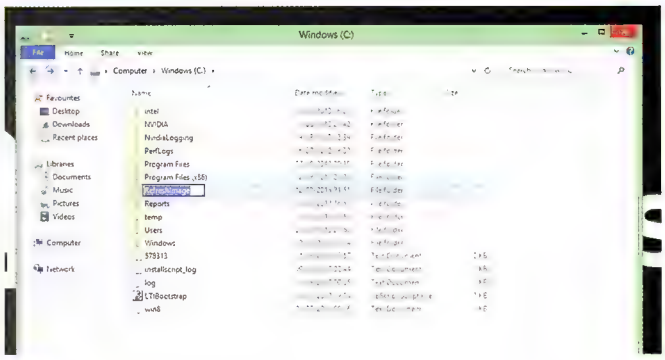
Step-by-step: Refresh your machine

Start shedding that excess software weight with a customised refresh.



1 IDEAL HOME

While it can be done at any time, it's probably worth setting your custom refresh image as early on as possible. Once you've uninstalled all the bloatware from your new machine, sat through all the updates Windows demands and installed the programs you absolutely have to have on a new machine, you're ready to recimg. It's worth remembering the image will take up a fair amount of space, too.

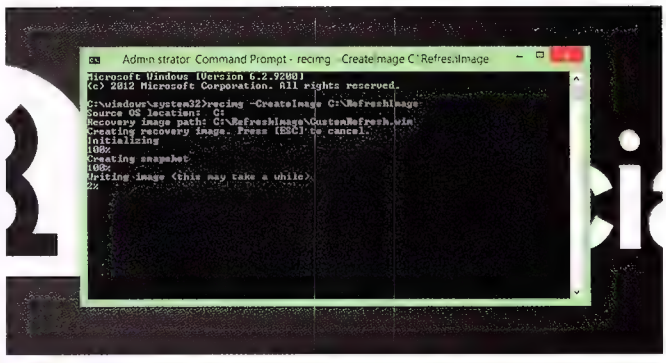


2 IMAGE IS EVERYTHING

Once your always-needed apps — for me that's *Kerbal Space Program* and *Football Manager* — have completed your ideal installation, it's time to take a snapshot. The first thing to do is create a new folder on an attached drive to house the new refresh file. Give it a simple, obvious name so you know where it's stored, allowing you to input it into the command prompt as easily as possible.

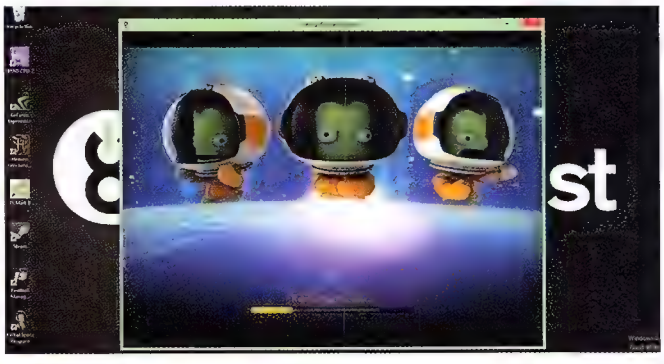
3 BE PROMPT

Now open the command prompt by pointing your mouse at the bottom-left corner of the screen and clicking the right mouse button. The power menu has a single click option to open an admin prompt. Click it and type: `recimg /CreateImage [address of image file]`. My file was on the C: drive called RefreshImage, so I typed `recimg /CreateImage C:\RefreshImage`.



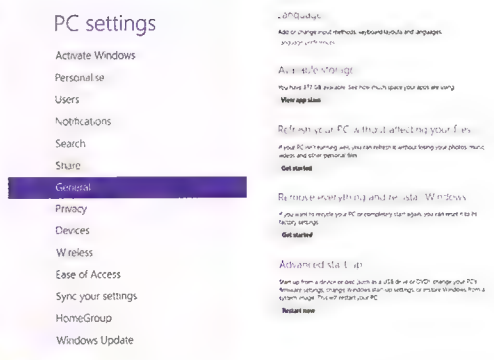
4 PATIENCE IS A VIRTUE

Windows 8 will now take a snapshot of your existing installation, but don't be fooled by how quickly this part gets to 100 per cent because writing the image will take some time. It does warn you, but I was surprised how long the rig sat at one per cent. Still, backing up my 18GB snapshot on the SkyFire's SSHD took just over an hour. Once it's written the image, Windows will register it as the go-to refresh file.



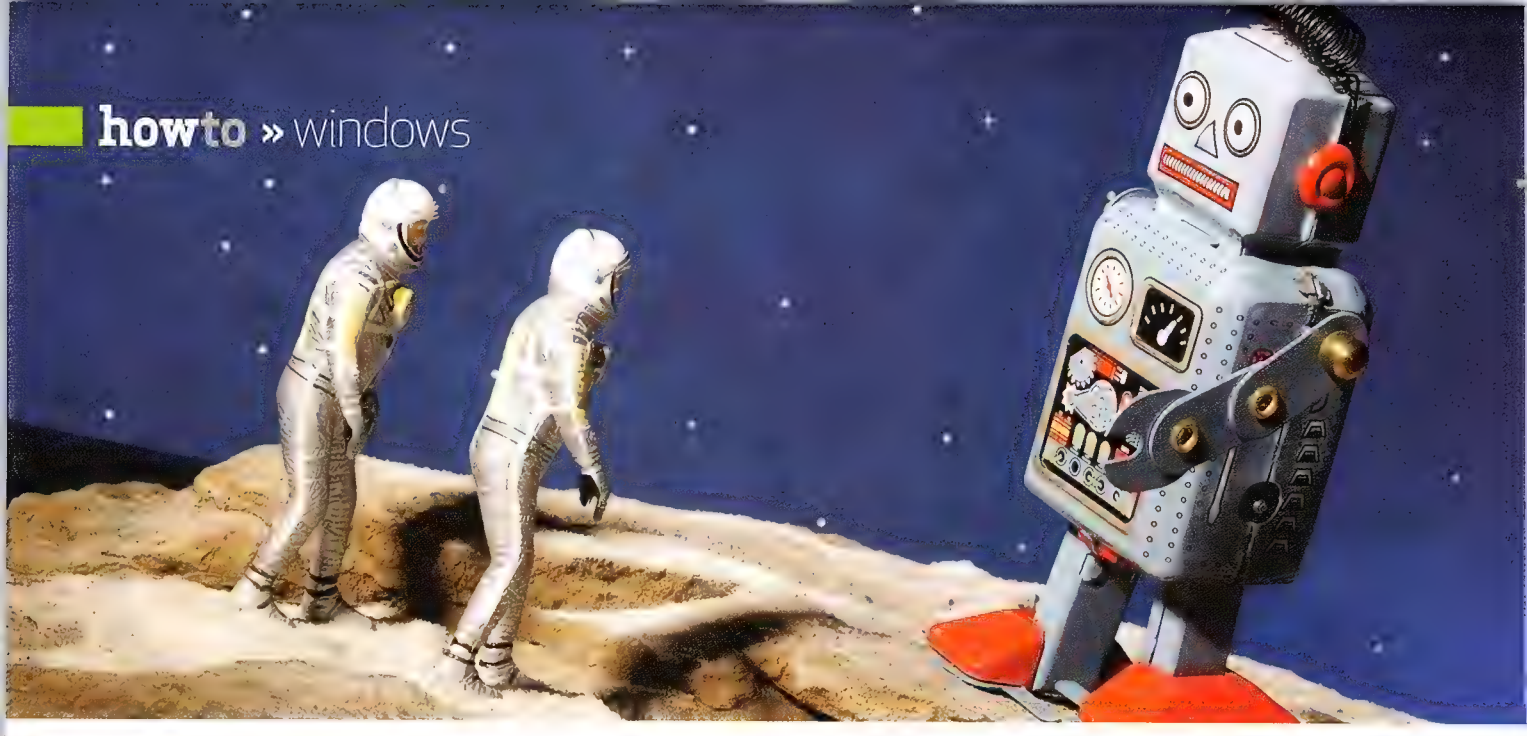
5 GO ON WITH YOUR LIFE...

That's it, your snapshot is saved — for extra peace of mind, you can save it to a removable drive for safe-keeping. The beauty of the refresh — especially this bespoke version — is that it's far more useful than a straight system rollback as you don't need to keep updating your snapshot, unless you wish to change which desktop apps are kept on refresh. Your chosen files will now remain post-refresh.



6 GET IT BACK

Refreshing is exactly the same, your bespoke snapshot is already registered as the refresh file so you just need to head into the Windows 8, Modern UI-based PC settings, click the 'General' option and scroll to the bottom of the page. There will be the option to refresh — click the button and Windows will do all the work. It took my machine 40 minutes to get from first click to a refreshed state.



Install XP on a virtual machine

Mark Wilson explains how you can set up a virtual machine to run a copy of Windows XP.

YOU'LL NEED THIS
VirtualBox

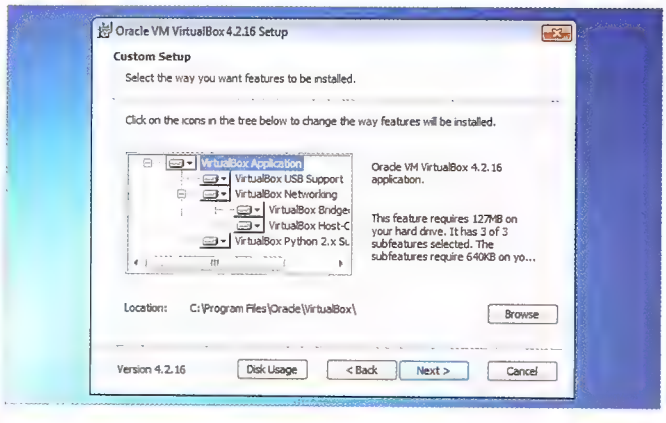
There are plenty of reasons why you might want to run different versions of Windows on your machine. You may have older software that can't run on Windows 7/8, or you may just prefer it for some tasks.

If you don't fancy going as far as setting up a dual boot system so you can choose which version of Windows to load each time you switch on your computer, setting up a virtual machine is a far easier and much more satisfying alternative.

Microsoft has provided free virtual copies of Windows XP that can be easily downloaded and used in conjunction with VirtualBox. This is free software that enables you to create a virtual computer within your copy of Windows, which can then be used to try out software and experiment with settings – without affecting your main Windows installation in any way, shape or form. So what are you waiting for? Read on and get Windows XP running on a VM!

Step-by-step: Install WinXP in VirtualBox

Enjoy using XP – without having to lose your Windows 7/8 experience.

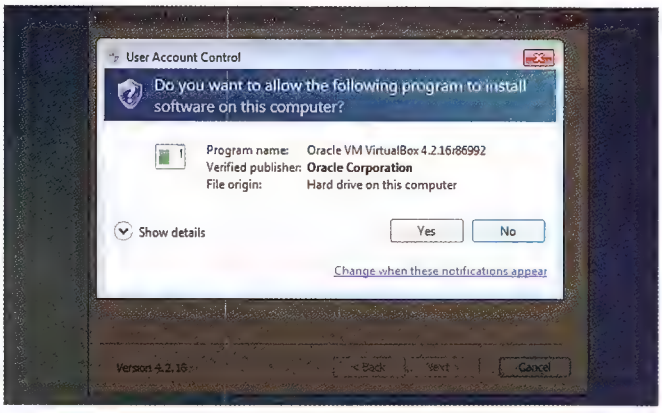


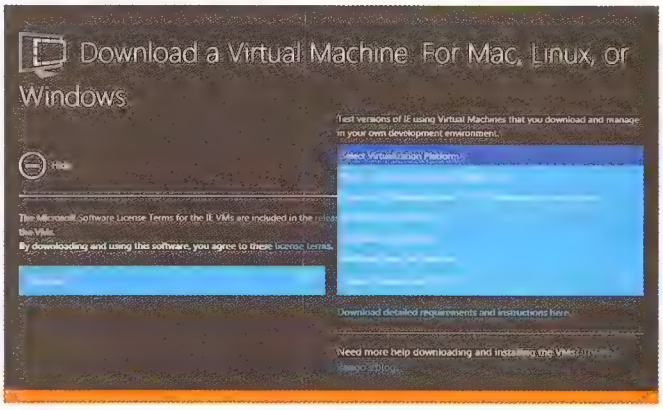
1 DOWNLOAD VIRTUALBOX

Launch Internet Explorer and pay a visit to the VirtualBox web site at **www.virtualbox.org**. Click the 'Downloads' link to the left hand side of the page, and then click the 'x86/amd64' link next to VirtualBox 4.2.16 for Windows Hosts. Choose where you would like to save the file and wait for the download to complete. The file is 95MB, so it may take a few minutes.

2 INSTALL VIRTUALBOX

Once the download is complete, double-click the file to start the installation and click 'Run' in the security warning dialog that appears. Click 'Next' to get started. There's no need to change any of the installation defaults, so just click 'Next' to continue. Click 'Next' to create desktop and Quick Launch shortcuts, then click 'Yes' to install a virtual network driver.



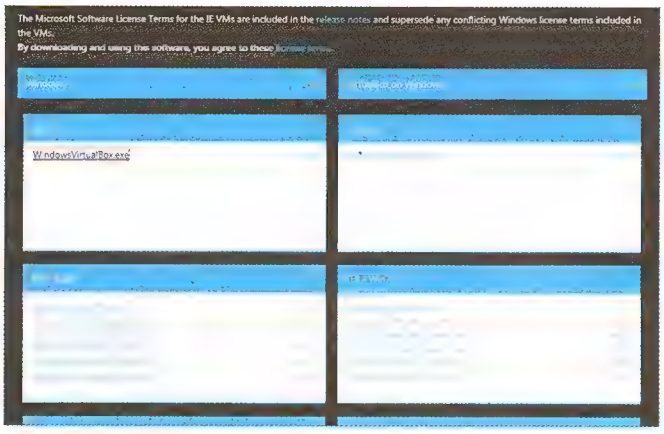


3 VIRTUAL NETWORK INSTALLATION

Click 'Install' to proceed, but be aware that during the installation of the virtual network driver you will be disconnected from the internet and your network, so make sure you aren't in the middle of copying or downloading any files. You may find that installing VirtualBox takes a few minutes. If a User Account Control dialog is displayed at any point, just click 'Yes' to continue.

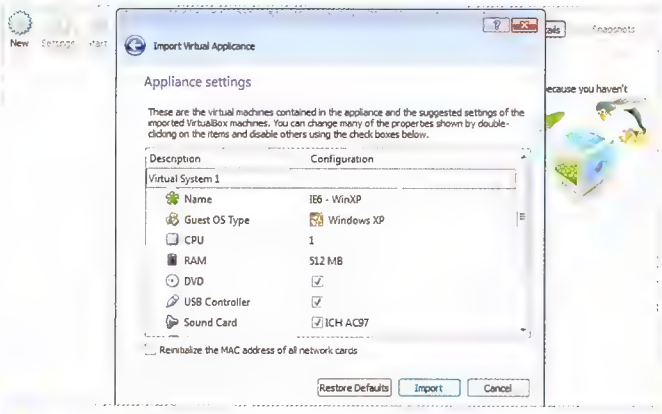
4 FIND A VIRTUAL MACHINE

Although you may well have an installation disc available for Windows XP, you need to download a special version from Microsoft to use instead. Visit **www.modern.ie** and click the 'Get free tools' button and then scroll down the page slightly before clicking 'Get free VMs'. Select 'Windows' from the first drop down menu and then click 'VirtualBox on Windows' in the second one.



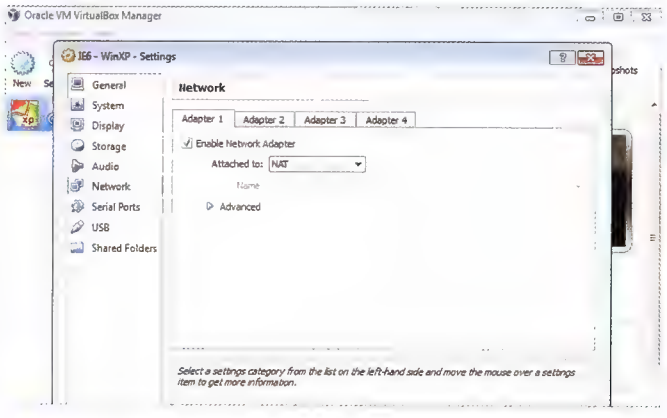
6 DOWNLOAD VIRTUAL XP

There are several virtual machine images to choose from on the download page; click the 'WindowsVirtualBox.exe' link in the IE6 – XP box, and then opt to save the file to a folder of your choosing. Bear in mind that this is a pretty chunky file – at more than 750MB in size – so it could take a while to complete if you have a slower internet connection. This might be a good time to make a cuppa.



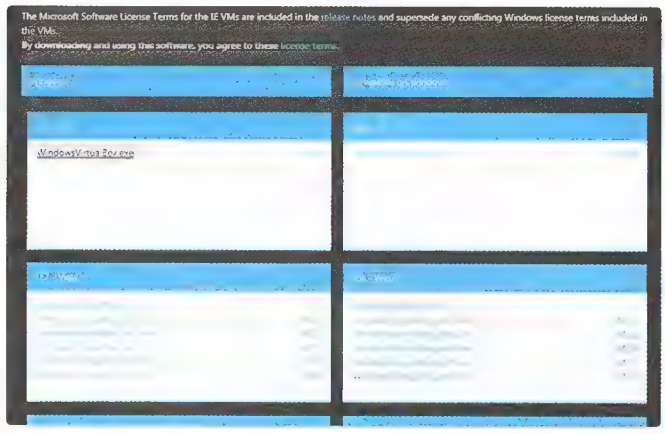
7 LOAD VIRTUAL XP

Click 'File' and select 'Import appliance'. Click the 'Open appliance' button and then navigate to the IE6 – WinXP.ova file you have just extracted. Select it and click 'Open'. Click 'Next' and you'll be invited to configure some machine settings. You should find that the settings selected by default work just fine, so click the 'Import' button to continue using them.



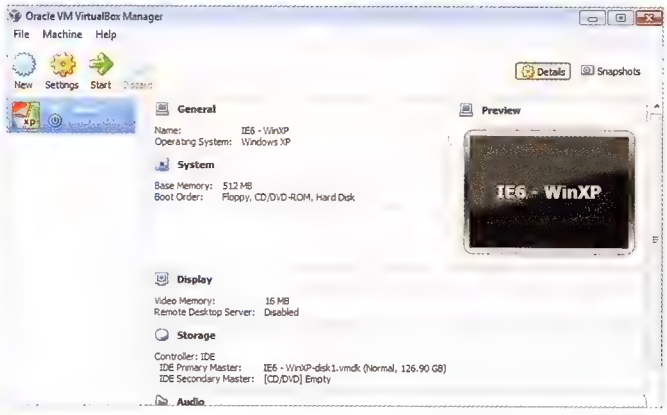
8 GETTING ONLINE

One problem you may encounter is that your copy of Windows XP may not be able to connect to the internet. If you do encounter this problem, simply close Windows XP and click 'Settings' in the main VirtualBox window before clicking 'Network' on the left. From the 'Attached to' drop-down menu to the right, select 'NAT' and click 'OK' before re-launching Windows XP.



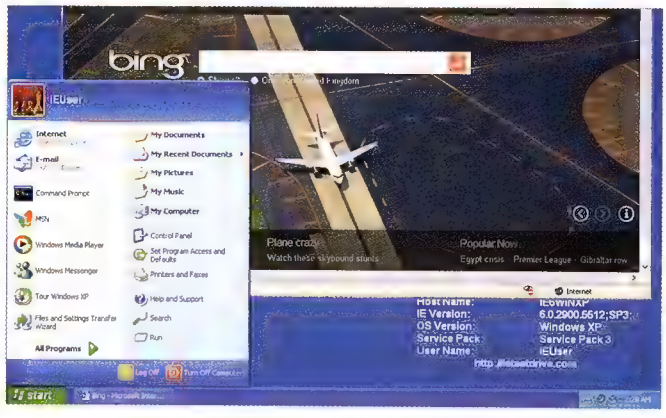
9 EXTRACT VIRTUAL MACHINE

When the download is complete, double-click the file to extract the contents. Click 'Yes' at the security warning dialog and then click 'Extract'. This will copy the virtual machine file direct to the same folder as your default downloads folder, but you can change it to something else if you prefer. When this is done, launch VirtualBox for the first time.



10 USING WINDOWS XP

You may find that it takes a little while for the virtual copy of Windows XP to be imported into VirtualBox. When this process is complete, you can select the virtual machine from the list that appears to the left-hand side of VirtualBox and then click the 'Start' button in the toolbar. Note that you will need to press the right-hand Ctrl key to free the mouse cursor from VirtualBox.



11 ENJOY VIRTUAL XP!

You've done it — Windows XP is now running in a VM! At first it may seem a little strange using a copy of XP within Windows 7, but it's something you quickly get used to, and it's extremely useful for testing out new software or ideas. You can use Windows XP in VirtualBox in the same way on any other computer, so it's almost like having two PCs for the price of one!

Linux migration to SSDs

How do you go about setting up an SSD with Linux, and what are the best practices to do so? Ashton Mills covers all the (super-fast) bases.

YOU'LL NEED THIS

SSD

Live CD

SSDs, once the hot new – and expensive – must-have tech are now cheap enough that we're approaching 75c a gig for the 1TB models and this is only set to drop. Inevitably, if you haven't already, making the move to an SSD is a no-brainer. The super-fast read speeds, let alone seek times, can make an old computer feel like new.

BACK UP YOUR DATA

Yep, the boring yet essential first step is backing up. There are two easy methods of doing this with Linux: back up just your personal data (usually /home) or do a full partition image. With both of these there are dozens of ways you can do it – after all, Linux is nothing if not flexible.

For backing up just your personal data you can use `rsync`, or `tar` and `gzip`, or a straight `cp` (for example, `cp -aruxv` to copy everything recursively with permissions preserved, skipping mounted file systems and ignoring files that have been previously copied).

Of course, there are also GUI alternatives. Popular tools include Duplicity, Ubuntu's Deja Dup and Linux Mint's Backup Tool. All of these make it easy to back up your home directory and more to another drive, sometimes over a network.

However, also remember to back up any files outside of your home directory that you might have changed. This could include your /etc/X11/xorg.conf file, your /etc/fstab file, any unique addresses in the HOSTS file and of course, anything under /usr/src (for example, the '.config' if you compile your own kernels).

When it comes to doing a full system image backup, there are again a range of tools available. Popular here are `partimage` and `clonezilla`, both of which are bundled in the extremely useful Parted Magic Live CD Linux distribution (**www.partedmagic.com**). By definition, you usually want to perform an image backup while not running the system you want to image, hence Live CDs like Parted Magic. You're not limited to just Linux-based tools, though: Windows programs will work fine, too. There are loads of options here from commercial products like Acronis to free for personal use tools like DriveImage XML or Macrium Reflect Free Edition, which includes both Linux and Windows-based USB bootable images. After all, imaging a partition is OS agnostic.

In fact, we'd actually recommend the imaging route, as it's pretty much a fire-and-forget solution – just as long as you simply want to transfer your existing Linux installation and personal files. If you plan to install a different or newer version of your favourite Linux distribution fresh, simply backing up your personal files is the way to go.

PREPARING THE SSDs

Whether you're making the move from a hard drive to an SSD, upgrading from one Linux distribution to another, doing a clean reinstall of Linux or repurposing an SSD between machines, the are two steps you should take.

UPGRADE THE FIRMWARE

Checking for the latest firmware is good practice. New firmware updates can include bug fixes, improved garbage collection routines and faster performance. However, they're often destructible to current data, so when doing clean system installs where you're going to wipe the drive anyway, you might as well head to the product's support page and check for any firmware updates.

SECURE ERASE

Secure erasing an SSD zeros all sectors, effectively making it 'factory new' as far as write performance goes. It's also the only way to truly delete data from an SSD – important if you're giving or selling the drive to a third party, for example.

As with upgrading the firmware, you should do a clean system install or system reimaging to secure erase the drive and return it to peak performance. To do this under Linux you have a number of options (of course) and we recommend the following.

Command line: Simply boot a Live CD Linux distribution, open up a terminal and run the following commands:

```
hdparm --security-set-pass NULL
/dev/sda
hpdarm --security-erase NULL /
dev/sda
```

Parted Magic comes with everything you need to backup, restore and manage the disks in your system.

TRIMming your SSDs

Linux supports passing TRIM commands to SSDs across the entire I/O chain from file system to the block device layer, to the device driver layer. This even includes device mapper and MD RAID setups, so you have full TRIM support for SSDs in RAID, even with onboard controllers like those found in popular Intel motherboard chipsets.

However, most distributions don't yet have installers that check if the install device is an SSD and set it up accordingly to use TRIM.

On the flip side, it only take a few seconds to enable. Simply perform the following actions.

Open a command prompt and run `sudo nano /etc/fstab`.

Find the entry that corresponds to your '/' root partition.

Append `,discard` after the other mount options. For example:

```
/dev/sda1 / ext4 noatime,nodiratime,errors=remount-ro,discard 0 1
```

Then save and reboot. Now when files are deleted, TRIM commands will be passed to the SSD.

What about if you've been running your system before adding this option? Linux also comes with its own full disk TRIM tool to clear unused blocks, appropriately named `fstrim`. To use it, simply provide it with a mounted file system, which can include your currently mounted and in-use root partition, like so:

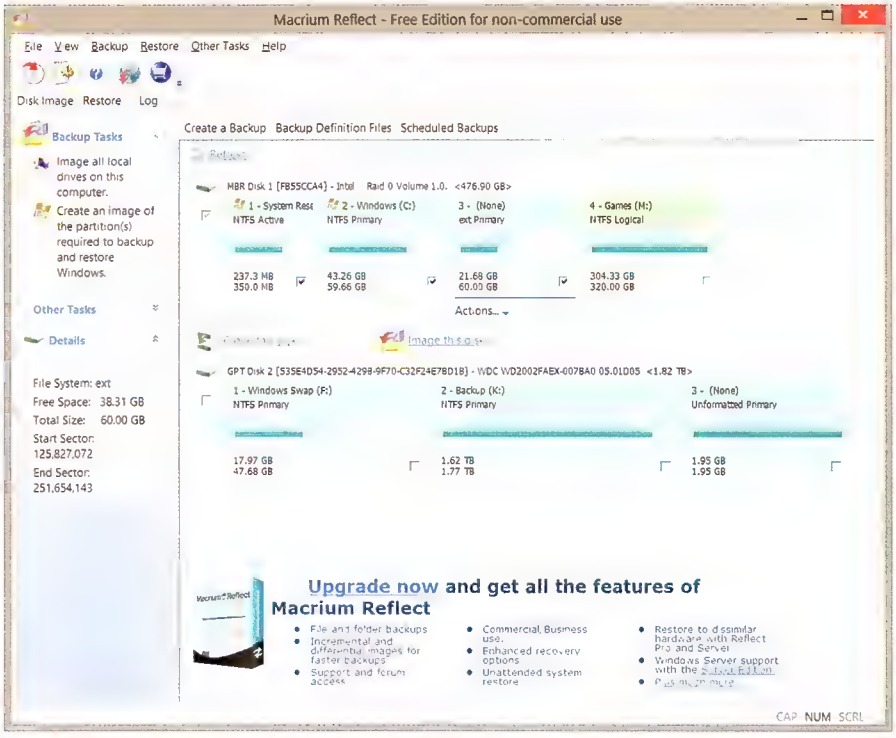
```
sudo fstrim -v /
```

The `-v` flag simply implies verbose, so you can see the volume of blocks cleared.

All SSD drives available today should support TRIM, although to be certain, you can check using a simple command: `lsblk -D`.

Any devices with 'DISC-ZERO' ('discard' zeroes data) support TRIM. The `lsblk` command is also great for seeing all file system types and mounts with the `-f` switch.

If a device is 'ROTA' (rotational, ie. a hard drive instead of an SSD), it mounts with the `-t` switch.



Many disk imaging tools, even Windows-based, will work just fine for imaging and restoring Linux partitions.

In the above, /dev/sda corresponds to your SSD. There's just one caveat: this may sometimes be refused by the drive if it's marked as 'frozen'. This is a flag set by the system's BIOS to protect the drive from unauthorised commands and unfortunately, the workaround isn't pleasant: you usually need to remove the SATA connector attached to the drive and plug it back in while the system is running. This will cause the flag in the SSD to be cleared. Linux won't mind, it will simply treat the drive as hot-plugged and allow you to access it once plugged in again.

Parted Magic: Instead of doing a secure erase directly from the command line, you can use Parted Magic's secure erase tool. This effectively runs the same commands, but provides a useful GUI front end to select the correct drive (certainly useful — you don't want to erase the wrong drive!) and importantly, to get around 'frozen' drives. It will allow you to force a system hibernation and restart — a clever way of clearing the flag and allowing the drive to be securely erased.

CREATE PARTITIONS

If you plan to restore from a full partition or disk image, this step can be skipped. The exception is if your original layout didn't have aligned partitions, in which case it's better to recreate your partition structure anew and copy the contents of your partitions across, rather than the partitions themselves.

Alignment is important, especially for SSDs. Ensuring the first partition on a drive falls on a sector boundary that's a multiple of the drive's erase block size and page size ensures no unnecessary writes from data crossing erase block boundaries. This isn't just a function of performance, unnecessary writes will also impact its longevity.

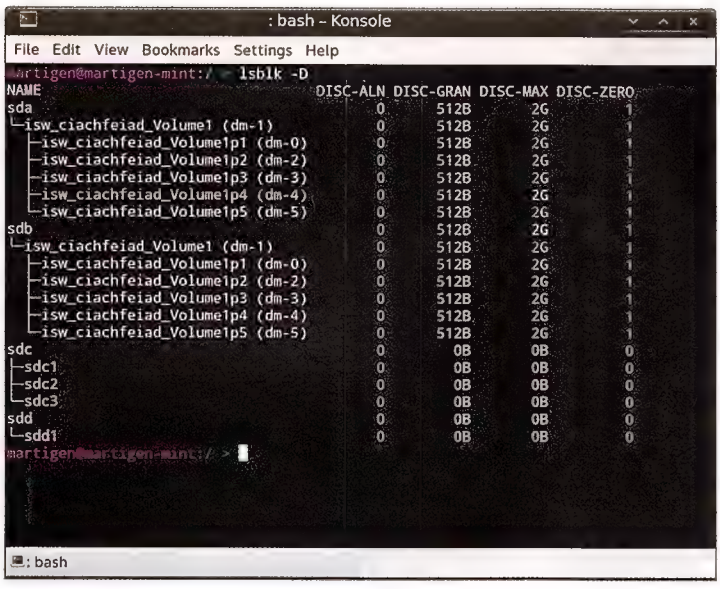
Any modern distribution's install tools should do this automatically for you now, starting the first partition at 1,024 or 2,048 sectors (preferably the latter, for as SSDs continue to grow in size so do their erase block sizes) and don't forget this should be larger if you RAID stripe — a 1,024 offset on a two-drive RAID 0 is only 512 sectors per drive, for example. Finally, as long as the first partition is aligned, all subsequent partitions immediately following will be aligned, too.

To check if your partitions are aligned before you image and secure erase the drive, or to check they're aligned afterwards, simply run:

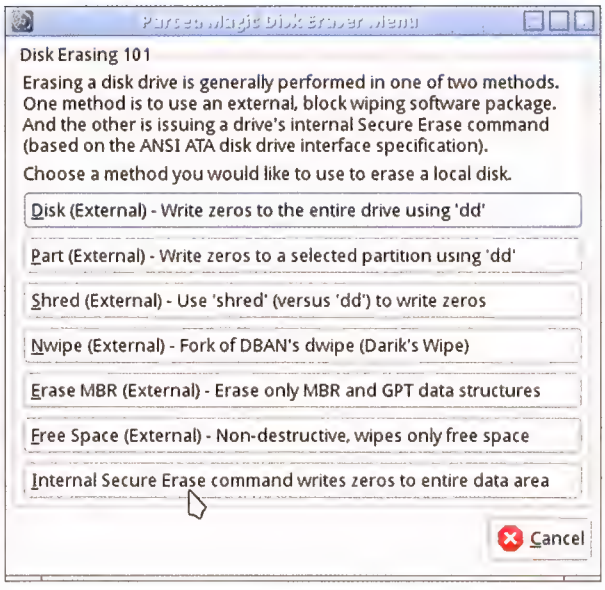
```
sudo fdisk -lu /dev/sda
```

Again, change /dev/sda to match your SSD as required. You'll see an ouput something like this:

```
 Units = sectors of 1 * 512 = 512 bytes
 Sector size (logical/physical): 512 bytes / 512 bytes
 I/O size (minimum/optimal): 65536 bytes / 131072 bytes
    Device Boot      Start         End      Blocks   Id  System
 /dev/sda1   *        2048      718847      358400    7  HPFS/NTFS/exFAT
 /dev/sda2          718848   125827071    62554112    7  HPFS/NTFS/exFAT
 /dev/sda3       125827072   251654143    62913536   83  Linux
```



The `lsblk` command has many uses when it comes to your disks.



Parted Magic's erase tool now supports performing a secure erase on an SSD.

The first partition begins at sector 2,048, so the partitions on this drive are aligned. If they're not aligned, creating them as such is easy. Simply open a terminal from a Linux Live CD and run:

```
sudo fdisk -c -u /dev/sda
```

And then make your partitions as normal (`man fdisk` for help). This simply tells fdisk to use sectors rather than cylinders for drive geometry, and when creating the partition you can select a starting position of 2,048. If you're not familiar with fdisk you can alternatively use GParted, a GNOME-based partition manager available in almost every distribution and thus present on Live CDs. Alternatively, the installers for most modern distributions will ensure a 2,048 starting boundary when creating new partitions on a disk during install. Finally, for yet another option, if you're more comfortable with Windows, Windows 7 and 8 will also ensure partitions start on an alignment boundary if you create partitions using it on a clear, empty drive.

RESTORING DATA

This is mostly self-evident regardless of whether you use the command line, tools like Duplicity or Deja-Dup or whole image programs like partimage or Macrium Reflect. However, there's one caveat to be aware of if you're restoring a whole disk image.

GRUB, the default Linux boot manager, and the Linux OS itself will recognise your boot and root drives via their universally unique identifier (UUID). Generally, UUIDs are useful as they allow a drive to be directly referenced even if you add or remove drives from your system – consider the /dev/sda nomenclature, the order for which changes depending on how the drives are discovered by the drive controller. This is all fine and good usually, because your Linux boot drive will always be found, no matter if hardware changes in your system.

The exception is if the boot drive itself changes – if you're reimaging to a new SSD from a hard drive or another SSD, then it naturally has its own UUID, which means your GRUB config and /etc/fstab entry that specifies your root drive will no longer be correct. The result is your newly restored Linux system won't boot. Fortunately, this is easy to rectify. First boot a Live CD, then open up a terminal and run:

```
sudo blkid
```

This will display disk label, file system type and UUIDs for all drives in your system. Note the UUID (or copy and paste it to a text document). Next, mount your new Linux system install on the SSD. Depending how your Live CD is set up, an easy way is to simply run:

```
sudo -s
cd /mnt
mkdir donuts
mount -t ext4 /dev/sda donuts
```

The directory doesn't matter, it's just a mount point for you to access the drive. Now you have access, it's time to edit two files. First the GRUB configuration file (or use gedit or similar to edit if you prefer):

```
nano /mnt/donuts/boot/grub/grub.cfg
```

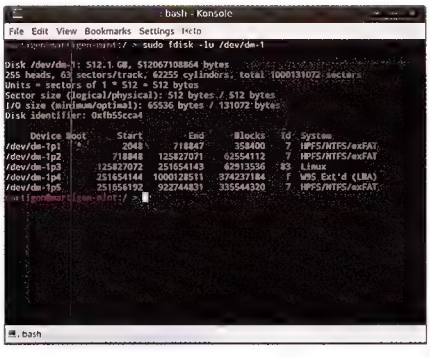
Scroll down to the first menu entry you usually see when you boot via GRUB. Alternatively, hit 'Ctrl+W' to search in the Nano editor and search for `--set`. You'll see a command `--set=root` in the boot menu that's followed by a UUID. Simply change this to the UUID of your new SSD and hit 'Ctrl+X' to save. Now edit your fstab file like so:

```
nano /mnt/donuts/etc/fstab
```

The very first non-commented entry is usually referencing your root drive (aka '/'). Before this you'll see a `UUID=` line. Again, update this to reference the new UUID of your new SSD and hit 'Ctrl+X' to save.

And that's it. If you reboot your system and remove the Live CD, GRUB should load and you'll be able to boot your restored Linux install.

For the purists, while it's technically not usually a good idea to directly edit the GRUB configuration file, as it's automatically generated, this method is fine for getting back into your system. In fact, it will remain static until the next time `grub-update` is run (when you install or upgrade a kernel, for example) and at this time it will pick up the UUID of your new drive and write this to the config just the same.



Checking for correct partition alignment with the `fdisk` command.

Automate your Mac

Use Hazel to deal with everything from mundane tasks to complex workflows. Craig Grannell shows you how.

YOU'LL NEED THIS
Hazel 3.1.3+
OS X 10.7+
Some images
FTP space (optional)

If your Mac was intelligent, it would look after all your files for you and keep everything tidy. You'd never have messy Downloads or Desktop folders, because everything would be neatly filed away at all times. When you wanted to perform a specific task, such as optimising and uploading a bunch of images to your blog, you could have your Mac do all the grunt work and get on with more pressing concerns, such as watching amusing cat videos on YouTube.

We're some way off of that halcyon dream, but Hazel brings you a step closer. The app is essentially a monitoring tool combined with powerful user-defined rules, which are rather like the sort of thing you'll recognise if you've ever used OS X smart folders/playlists/albums. You create your rules to determine what happens to specific file types, set Hazel to watch specific folders, and let the app get on with it.

By way of the simplest example, let's create a very straightforward new rule. In the Folders tab's Folders column, click the + and select your Downloads folder. In the Rules pane, click the + to create a new rule. Name it PDFs. Note how the blank rule already has two sections: 'if' and 'do'. The former houses a condition or set of conditions relating to the files you wish to target; the latter is what you want done with them.

For the conditions of this rule, set the pop-up menus to read 'Kind is PDF'. For the 'do' section, set the action to Move, and then click the folder pop-up, select 'Other' and choose a folder you want PDFs moved to, such as /Documents. Click OK. When this rule is checked in the Rules panel and when Hazel is active, all PDFs placed in your Downloads folder (including those downloaded from the web) are sent to /Documents.

You might think that a tad hasty. After all, the Downloads folder can be useful for storing things you're just about to check out. If that's the case, add another condition to the rule, in order to turn it into something for archiving. Double-click to open it, and then click the '+' at the far-right of the existing condition to add another. Set the new condition to read 'Date Added is not in the last 30 days'. Now, only PDFs that have been lurking for more than a month are archived.

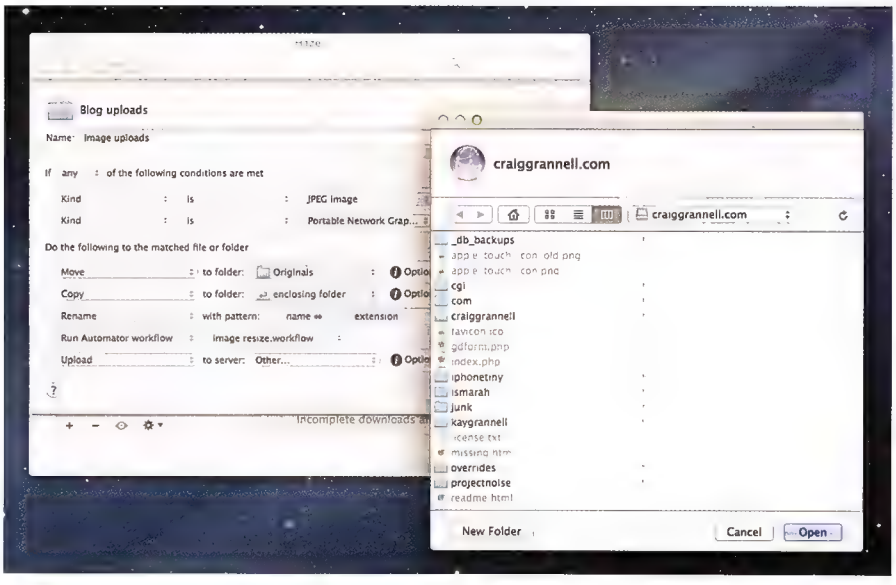
With a little lateral thinking, Hazel can be roped into doing many of your basic filing tasks, without you having to lift a finger. Explore its menus and you find conditions based on label, file kind, size, contents, URLs, and more. Actions are similarly diverse, including various file actions, uploading, archiving, importing into iTunes or iPhoto, and notification displays.

JARGON BUSTER

A shell script is a script written for an OS's command line interpreter. You can program commands and have them execute. With Hazel, it's a means of adding power, enabling it to do tasks beyond what's available in the UI.

In the walkthrough, we lead you through the process of creating a multi-step workflow that automates the procedure of uploading images to a blog. Images are duplicated, renamed, resized and uploaded via FTP. Also, remote filenames are appended to a text document. Once the workflow is set up, all you have to do is drop images on to a folder in the Dock and Hazel takes care of the rest.

The walkthrough might seem very specific, but it familiarises you with some of the more advanced features of Hazel, such as integration with Automator workflows and shell scripts, and its ability to work with text files. Try experimenting with individual parts of the walkthrough to create new workflows for yourself. For example, you can use appending text to keep a log of specific Hazel actions, and the renaming section to tidy up files downloaded from the web. It's amazing what you can do.



Careful when setting up FTP details, you can't edit them later. Single-click folders to navigate in the depicted window.

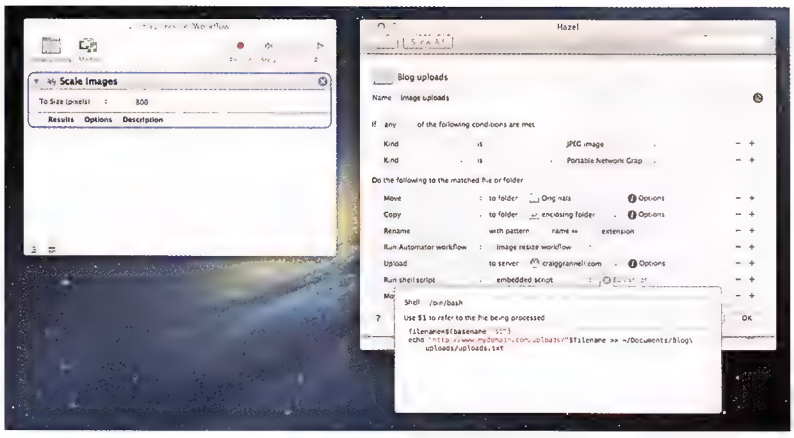
STEP-BY-STEP: AUTOMATE UPLOADING IMAGES TO A BLOG

1 SET THINGS UP

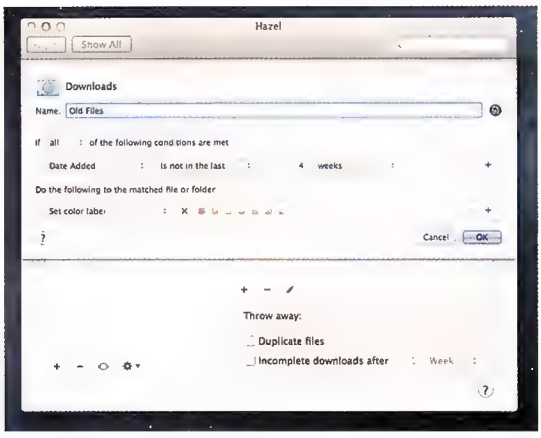
Hazel needs folders to work with, for tracking and for sending files to. In your /Documents folder, create a new folder called 'Blog uploads'. Within that folder, create two more: 'Originals' and 'Uploaded'. If you wish to access the 'Blog uploads' folder more easily later, drag it to the Dock.

2 FIGURE OUT A WORKFLOW

Hazel takes each file and performs a chain of actions on it. We know we're starting with an image. We also know our end-state: the original image filed in 'Originals', the reworked image uploaded to the web and filed in the 'Uploaded'



By integrating Automator workflows and scripts, Hazel becomes very powerful.



Simple Hazel rules can also be useful; this one labels files red if they've been sitting around for a month.

folder, and the uploaded image's filename appended to a text document. Hazel has a copy command, but once the copy is made, the original file is abandoned, and the first part of the workflow is to move our file to 'Originals'. We copy it back to the enclosing folder, manipulate it, upload it, and file it in the 'Uploaded' folder, before sending its renamed filename to a text document.

3 CREATE AN AUTOMATOR WORKFLOW

Hazel can't resize files, but we can use Automator. Go to 'File > New' and choose 'Workflow'. Double-click 'Scale Images' in the actions listing and click 'Don't Add if a warning appears'. Set a pixel size for your reworked images, and then save your workflow as 'image resize' in your 'Blog uploads' folder.

4 NEW WORKFLOWS AND CONDITIONS

In the Folders tab, click '+' in the Folders column and select 'Blog uploads' in dialog box. Click '+' in Rules; name your rule 'Image uploads'. We want the rule to affect PNG and JPEG documents. Set the initial condition to 'Kind is JPEG image', use the '+' to add another, and set that to 'Kind is Portable Network Graphics Image'. Set 'if all' statement to 'if any'.

5 MOVE YOUR FILES

It's time for 'do' conditions. Set the first rule to 'Move to folder: Originals', selecting your Originals folder. Add another condition set to 'Copy to folder: enclosing folder'. This creates a copy of the original back in the 'Blog uploads' folder.

6 RENAME AND RESIZE

Add another condition, and set the action to Rename. The default pattern (name, extension) is fine, but we want to make the name 'web safe', converting it to lowercase and replacing spaces with hyphens. Click 'name' and in the pop-up, click the triangular widget in the 'name' lozenge and select 'lowercase'. Click the widget again and select 'Replace text…'. Type a space in the first box and a hyphen in the second. Click 'Done'. Add another condition and set the action to Run Automator workflow. Select your saved workflow.

7 DEFINE AN UPLOAD LOCATION

Add a rule that uses the Upload action. Add the details for your remote server, including username and password (the latter to be stored in your keychain). Click 'Connect' and Hazel logs in. Click to navigate to folders and once you're inside your destination folder, click 'Open'. Take care though as Hazel lacks the means to later edit server details.

8 RUN A SHELL SCRIPT

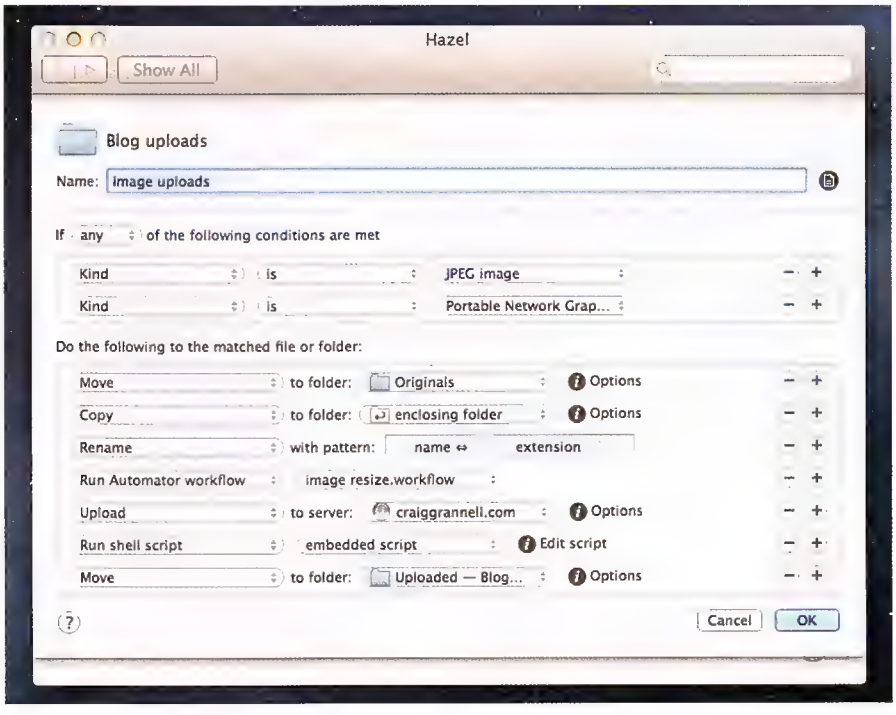
We're now going to use a script to append the name of each uploaded file to a text document. This means you could upload a dozen images and be able to find out (and copy/paste) their URLs just by opening this file. In a new condition, use 'Run shell script'. Click on 'Edit script' and type:

```
filename=$(basename "$1")
echo "http://www.mydomain.com/
uploads/"$filename >>
~/Documents/Blog\  uploads/
uploads.txt
```

The first line defines a variable that's your document's filename. The second appends that to a text file, uploads.txt in the Blog uploads folder. The quoted section is the path to the file online, so change it to suit for your domain/web space.

9 FINISH OFF AND TEST

Add a final Move rule, sending your image to the Uploaded folder. Click 'OK', ensure your rule is active and then drop images into your folder. Hazel should run through the workflow. If you have problems, try duplicating your rule and test portions of it by deleting other conditions.



The completed rule in all its glory. This workflow saves hours once it's running.

Stream any format to iOS

Nick Peers shows you how to stream any video file to your iPad or iPhone with the help of VLC Streamer.

YOU'LL NEED THIS
VLC Streamer
A Mac
An iOS device

For many people, full-blown media servers like XBMC are overkill if all you want to do is stream the odd movie from your Mac to your iPhone or iPad. In most cases, iTunes makes it easy to connect to your computer for media-streaming purposes, but what happens if you have a collection of movies in a range of formats that iTunes doesn't recognise? It can be fiddly converting these just so you can view them on your iOS device.

This is where VLC Streamer comes in. It's the perfect tool for streaming movies – of just about any type – on the fly from your Mac to your iPhone or iPad. Your Mac does the hard work of converting the movie into an optimised version you can stream over your Wi-Fi network, and then you can sit back and watch the movie from anywhere in your home.

It's not difficult to use – as you'll discover by following this guide. The free version of the VLC Streamer app is ad-supported, but the premium version ($1.99), throws in some useful extras on top, such as copying converted movies to your iOS device for watching offline, as well as the ability to output your stream to other AirPlay devices, including an Apple TV box.

QUICK LOOK IOS STREAMING

A PRESETS
By default, VLC Streamer places you at the Bandwidth screen, where you'll find the same four basic presets, as found in the VLC Streamer Helper application on your Mac.

B SETTINGS
Tap Advanced settings to manually set the picture width, video bitrate and audio bitrate yourself, to get a custom blend of quality and performance.

C AUDIO/SUBTITLES
If a movie file (typically on DVD) has multiple audio tracks and subtitles, the relevant icon will be highlighted here.

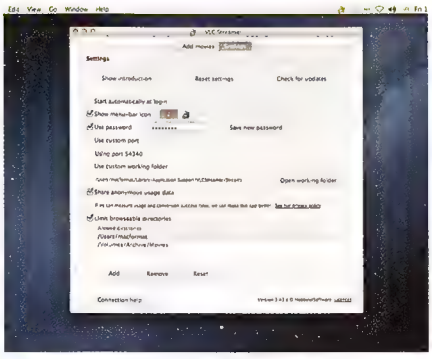
D STREAM OR COPY
Your final choice is to stream the converted file from your Mac when processed, or to copy it to your iOS device for watching offline later. (The latter option isn't available in the free edition.)

Step-by-step: Stream video to iOS devices

Re-encode and stream video files directly from Mac to iOS..

1 INSTALL ON MAC AND IOS

First, install VLC Free Streamer on your iPad, iPhone or iPod touch from the App Store. Next, download and install the VLC Streamer Helper software on your Mac from **tinyurl.com/2d2mprs**. Launch the tool from your Applications folder; click 'Open' when the warning prompt appears.

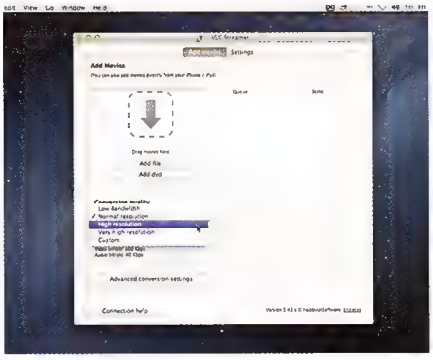


2 TWEAK SECURITY SETTINGS

Skip the wizard and opt whether or not to share anonymous usage data. Tick 'Limit browseable directories' to make only certain folders accessible from your iOS device; tick 'Use password' to add another layer of security to your streaming should it be necessary.

3 MAKE CONNECTION

With VLC Streamer running on your Mac, launch the VLC Streamer Free iOS app to verify the network connection — if your Mac doesn't appear, click the Connection help button on the Mac to visit a test web page, with tips for resolving the issue if things aren't working.

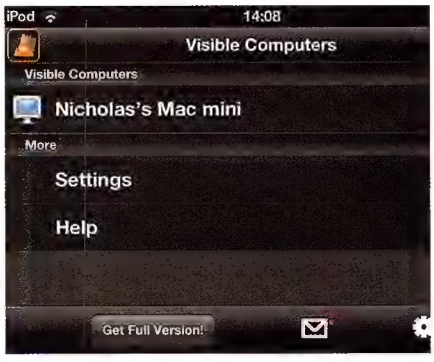


4 ADD A MOVIE FROM MAC

To prepare a movie for streaming on your Mac, switch to the 'Add movies' tab. First, set the conversion quality (picture width, video, audio bitrate). The four presets are: for flaky networks (low bandwidth), iPhone (normal), iPad (high) and HD streaming to Apple TV (very high).

5 CONVERT AND WAIT

Add a file or DVD and VLC Streamer starts to convert it into a format at the chosen quality for streaming to your iOS device. You can queue up more movies — converted ones reside in the program's working folder (see the 'Settings' tab), ready to be streamed again and again.



6 SWITCH TO MOBILE

We recommend you wait until the movie has been converted before streaming for the best possible viewing experience. Switch to your iOS device, tap your computer name and log in with your password if necessary. A list of available movies will appear.

7 STREAM MOVIE

Wait while the first part of the movie is streamed to your iOS device. Once it starts playing, tap the screen to bring up the playback controls — tap the button in the top right-hand corner to go full-screen. (The banner ad at the bottom doesn't appear in the paid-for version.)

8 PICK FROM MOBILE

You can select movies to stream direct from your mobile. Return to the main screen and tap 'Add a movie'. Browse the folders on your Mac for a movie, set the streaming quality via the Bandwidth or Advanced buttons, then tap 'Watch' — your Mac converts and streams it!

Back up your Android

Even non-rooted Android devices need to be backed up, says Simon Chester.

Rooting your device is a big commitment. Not only does the process usually void your warranty, but it also means the end to carrier-supplied updates. For me, aside from a few root-only apps, the biggest advantage of rooting a device is the ability to make backups of all my apps and data – which makes the process of moving to a new phone or ROM significantly easier.

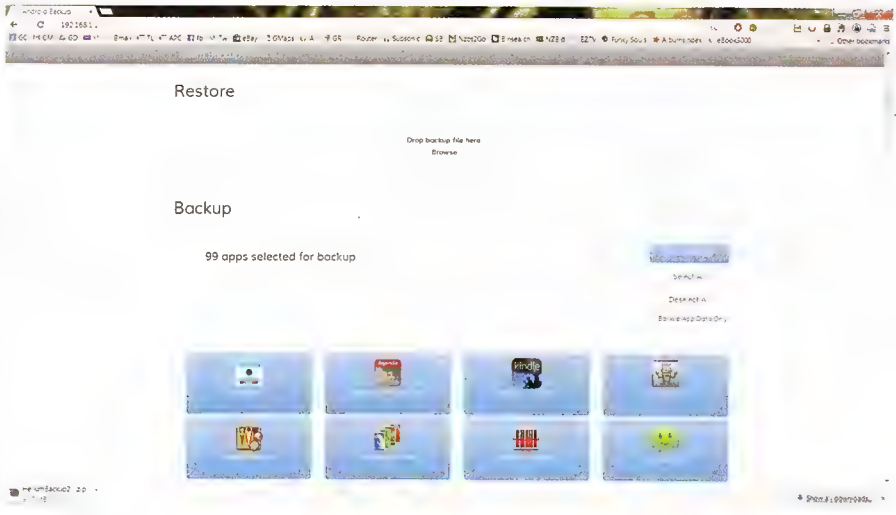
Now, however, those whom don't want to root their device can run backups of (almost) all of their apps on (almost) any device – using a combination of an app + desktop companion program.

Additionally, for those whom are emphatically pro-root, the act of rooting often involves a full wipe (thanks HTC), so you'll be pleased to hear that you can now bring your apps over from your non-rooted device to your freshly liberated one.

The app you need is Helium (previously known as Carbon) – created by the famed creator of Clockwork Mod recovery, Koush.

Helium comes in two flavours, free and premium ($4.79), with the premium version removing the ads, allowing scheduled backups, and supporting Dropbox, Box, or Google Drive storage for and retrieval of the backups.

One additional feature of Helium premium (I just love saying that) is its ability to directly sync app data between your Android devices – very handy for game progress or other apps that require some tweaking to get right.

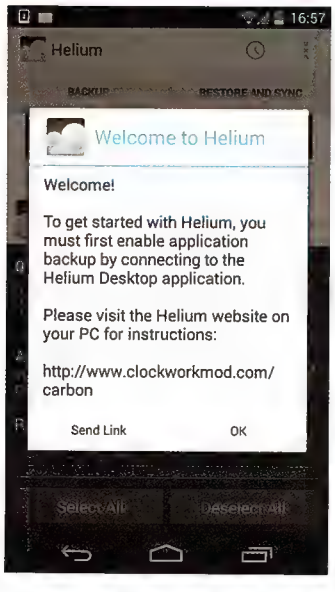


You can run, restore, and download device backups from your PC's web browser.

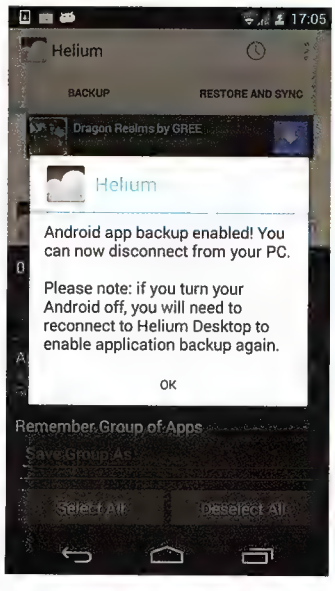
Rooted users can also benefit from Helium – as it offers a simpler interface compared to the popular root-only backup app, Titanium Backup. Rooted devices also don't require the use of the desktop companion app to set up the app.

The biggest limitation of Helium is that, unlike Titanium Backup, Helium uses Android's in-built backup system (via adb). This means that those devices (eg Motorolas and some Sonys) that have fiddled with the in-built backup system won't work, and those apps that aren't programmed to be backed up, can't be. So, for full app backups (and other 1337 wizardry), you still need to root your device. But, enough preamble, onto the backing up!

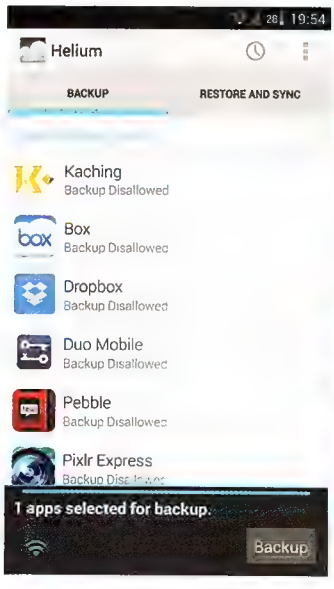
Step one, unsurprisingly, is to waddle over to the Play store and install Helium. If you feel the premium features are worth the $4.79 (I do), you should additionally install the Premium license key app, but I'd set up and run the free one once before forking out your dollars, just to make sure it works and you're happy with it (keeping in mind its limitations). As you're purchasing a licence key – rather than a whole new premium app – all of your settings will carry over when you do decide to upgrade.



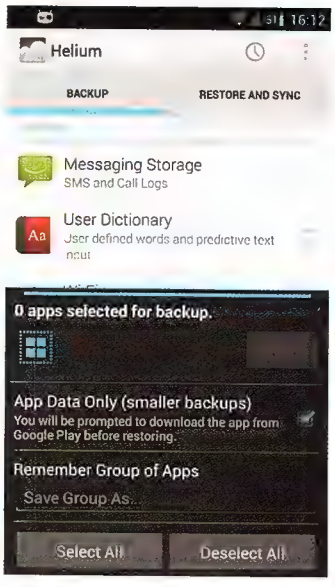
Non-rooted users are prompted to install and run the Helium Desktop application.



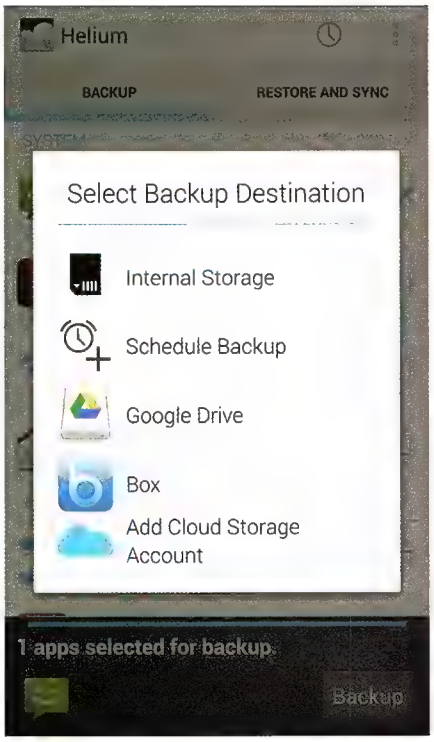
Non-rooted users require the desktop app to enable backups properly.



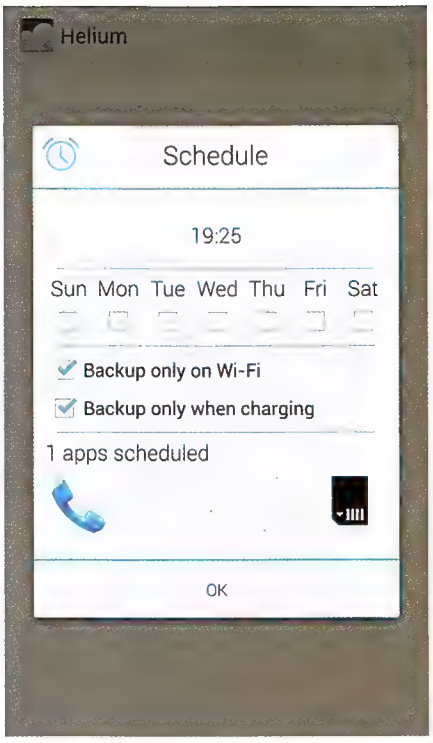
Note that not all apps can be backed up by Helium.



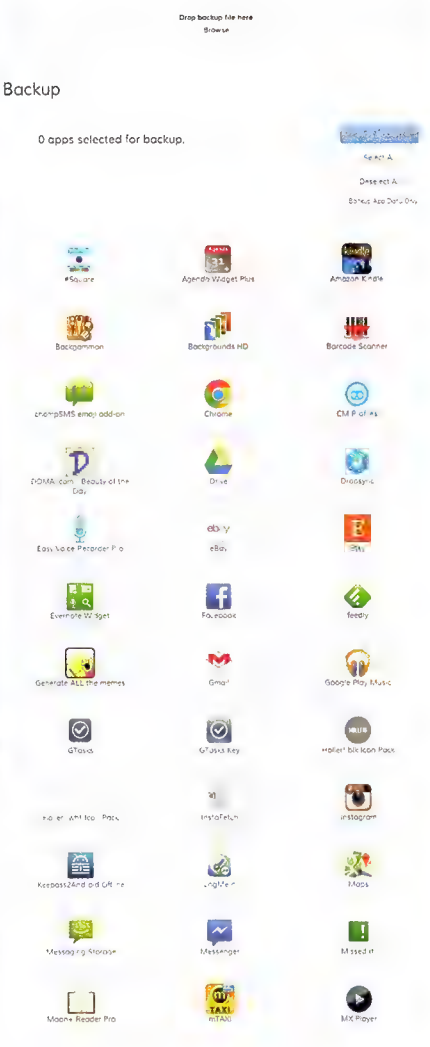
You can choose to only backup app data, which reduces backup size.



The premium version of Helium allows backing up to Dropbox, Box, or Google Drive.



Additionally, the premium version also allows scheduling of backups.



You can select which apps you wish to backup via the web interface.

You now need to visit **www.clockworkmod.com/carbon** and download the companion app for your preferred PC OS (it runs on Windows, Mac, and Linux). If you've never connected your phone to your Windows PC over adb before, you will also need to download and install the Android Windows drivers, available on the same page.

Once you've installed the two apps (and the Android drivers), open the desktop app, and connect your Android phone. These next steps may differ from phone to phone, but you'll be OK if you just open Helium and follow the on-screen prompts. Once everything is configured correctly, you'll get a pop-up on your phone asking if you want to grant debugging access to the PC. You'll have to say yes to this.

I'd also recommend granting Helium access to your Google account, when prompted, so that you can sync app data between Android devices (well, premium users can at least).

You'll see a big green tick on the desktop app if everything worked. You can now disconnect your phone and run backups without having to connect your phone to your PC again – that is, until you reboot your phone (root users won't suffer from this limitation).

One very important thing to realise is that copying the Helium folder over from your device to your PC won't actually allow you to transfer backups between devices. To do this, you need to run the backup via the web-based interface. To start the web-based interface, press the three dot menu (or hit the menu button on your device) and select PC Download, which will then tell you the URL where you'll access it from on your PC.

Once you've navigated to that URL on your PC, select those apps you wish to backup, and select if you want to backup the full app, or just its data (if you select data only, the backup file will be smaller – in my case it was 275MB vs 685MB – but you'll have to download the apps from the Play Store when you go to restore them). When you hit start backup, you'll be prompted to save a ZIP file on your PC. It'll take a while to download. Be sure to store this somewhere safe.

If you were looking to wipe your phone, it's now time to copy off all of your personal files (photos, music etc), and wipe.

To restore a backup held on your PC, you'll need to install Helium on your new/freshly wiped phone, and again, start the web interface. Once you've navigated to the supplied URL, simply drop the backup ZIP you just created into the restore section at the top of the page.

Premium users can also backup their apps to the cloud, via Dropbox, Box, or Google Drive. To do this, just open Helium, select the apps that you wish to backup, then, after pressing the backup button, choose 'Add Cloud Storage Account', and you'll be prompted to enter your credentials.

To restore a backup stored in the cloud, visit the 'restore and sync' tab up the top off the app, and choose the cloud service where you stored your backup.

Additionally, premium users can schedule automatic backups of selected apps. This, combined with cloud storage, can make the loss of a phone a much less devastating event – provided you also automatically backed up your photos and other files (I use Dropsync Pro to do this nightly).

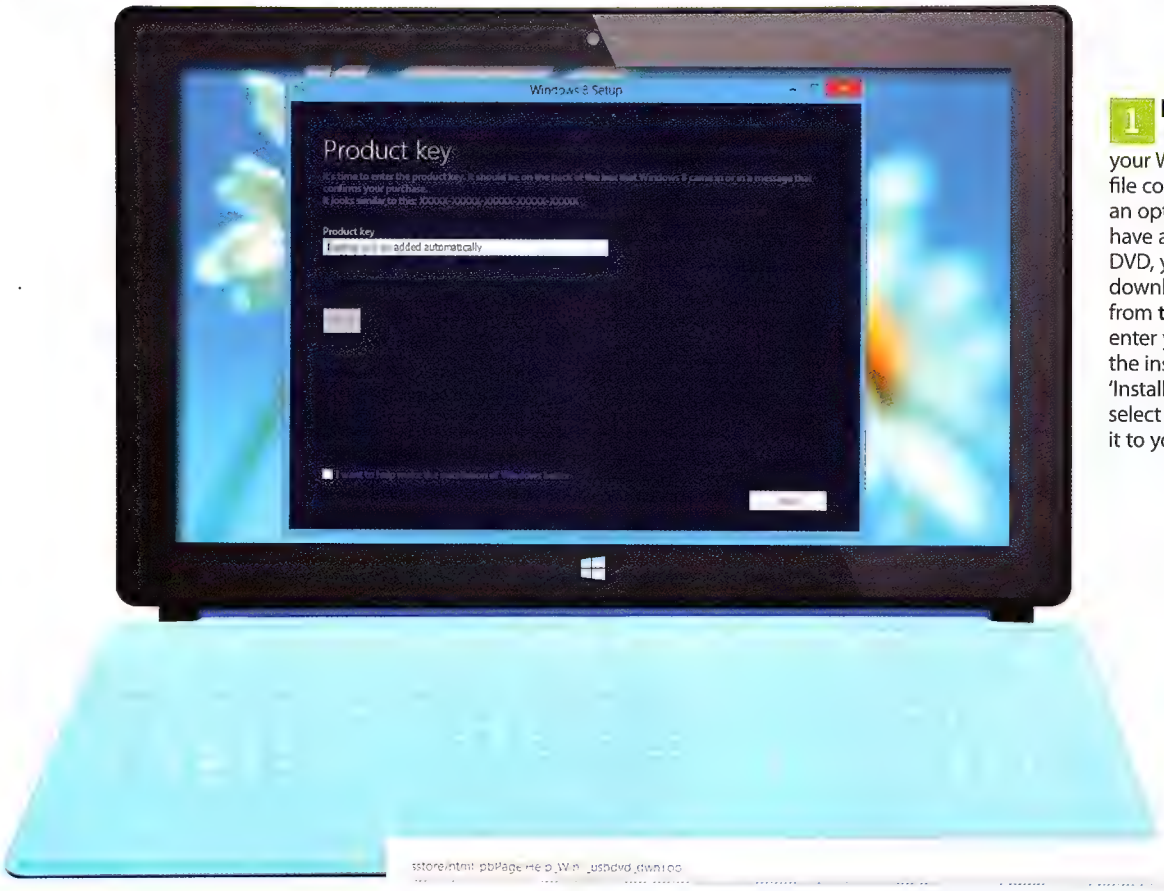
To set up schedules, it's just a matter of running the backup from within Helium, and selecting 'Schedule Backup' from the list of destinations (instead of 'Internal Storage' or your cloud provider), then enter your preferred time and day of the week. You can also choose to only run the backup if your phone is connected to a Wi-Fi network, and/or a power source.

The other super-fab feature of the Helium premium is the ability to sync app data between Android devices. When you first opened Helium, you were given the option to sync it with your Google account. If you do this on all the devices that you install Helium premium on, then they'll appear in the 'restore and sync' tab up the top of the app.

You can then choose the device that you wish to sync with, as well as which apps you want synced. As mentioned earlier, this is a superb feature for playing games on different devices, allowing you to pick up on your 10-inch screen from the same point you're at on your 4-inch screen.

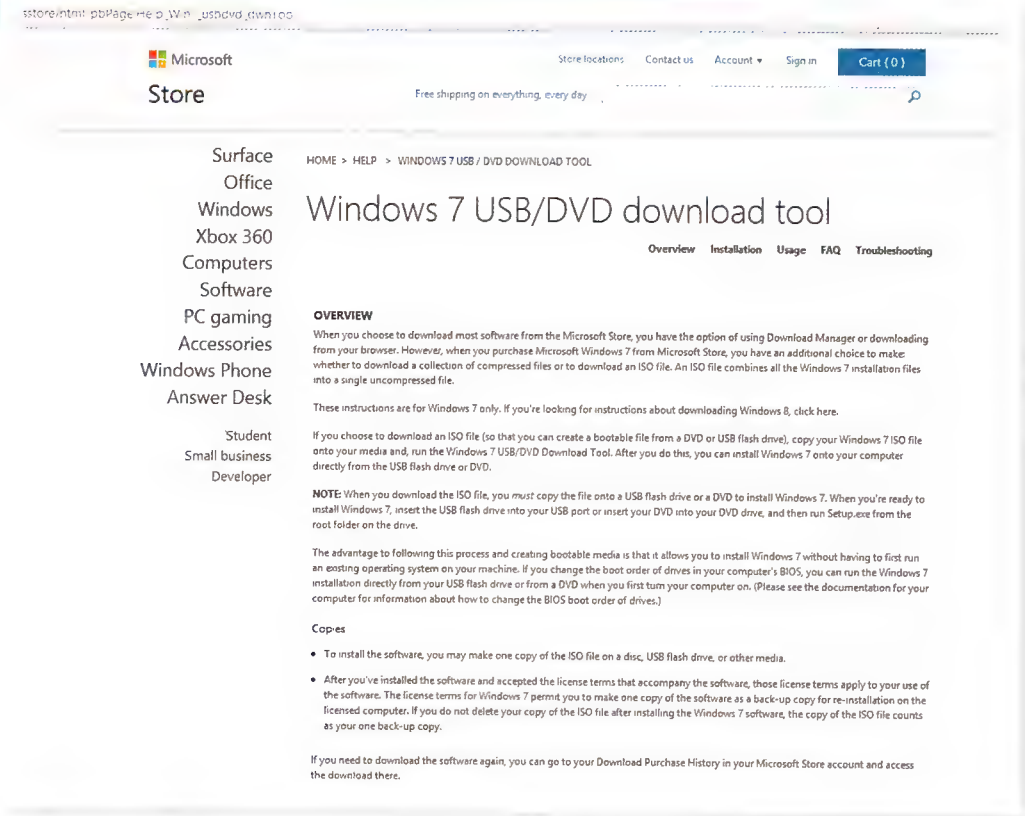
Make a USB install stick

Make reinstalling Windows 8 super easy!



1 PREPARE YOUR ISO
First, make sure you've got your Windows 8 ISO (an archive file containing all the data from an optical disc) handy. If you have a Windows 8 installation DVD, you can create an ISO by downloading Microsoft's tool from **tinyurl.com/92rc7xk**. Just enter your product key, follow the instructions and choose 'Install by creating media', then select the 'ISO file' option to save it to your hard drive.

2 GET THE USB MAKER
Once your ISO is ready and waiting on your PC, you can go ahead and start preparing your Windows 8 USB stick. First of all, you need to grab the Windows 7 USB/DVD download tool from **tinyurl.com/mry6yqd**. Don't worry about the name — it also works with Windows 8. Select 'Installation', click the link, save it and open the installer.


Microsoft Store

Store locations | Contact us | Account | Sign in | Cart (0)

Free shipping on everything, every day

Surface
Office
Windows
Xbox 360
Computers
Software
PC gaming
Accessories
Windows Phone
Answer Desk

Student
Small business
Developer

HOME > HELP > WINDOWS 7 USB / DVD DOWNLOAD TOOL

Windows 7 USB/DVD download tool

Overview | Installation | Usage | FAQ | Troubleshooting

OVERVIEW

When you choose to download most software from the Microsoft Store, you have the option of using Download Manager or downloading from your browser. However, when you purchase Microsoft Windows 7 from Microsoft Store, you have an additional choice to make: whether to download a collection of compressed files or to download an ISO file. An ISO file combines all the Windows 7 installation files into a single uncompressed file.

These instructions are for Windows 7 only. If you're looking for instructions about downloading Windows 8, click here.

If you choose to download an ISO file (so that you can create a bootable file from a DVD or USB flash drive), copy your Windows 7 ISO file onto your media and, run the Windows 7 USB/DVD Download Tool. After you do this, you can install Windows 7 onto your computer directly from the USB flash drive or DVD.

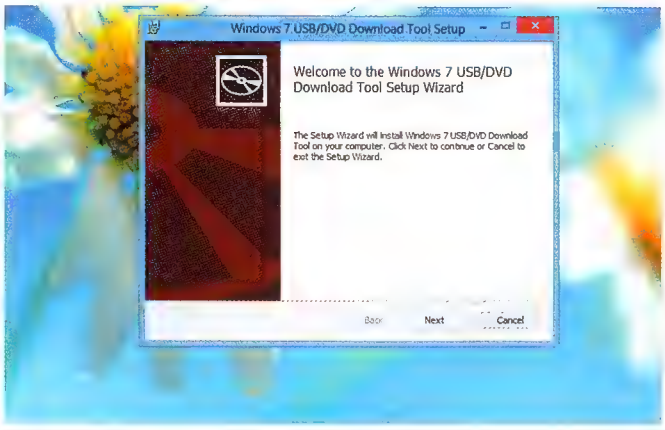
NOTE: When you download the ISO file, you *must* copy the file onto a USB flash drive or a DVD to install Windows 7. When you're ready to install Windows 7, insert the USB flash drive into your USB port or insert your DVD into your DVD drive, and then run Setup.exe from the root folder on the drive.

The advantage to following this process and creating bootable media is that it allows you to install Windows 7 without having to first run an existing operating system on your machine. If you change the boot order of drives in your computer's BIOS, you can run the Windows 7 installation directly from your USB flash drive or from a DVD when you first turn your computer on. (Please see the documentation for your computer for information about how to change the BIOS boot order of drives.)

Copies

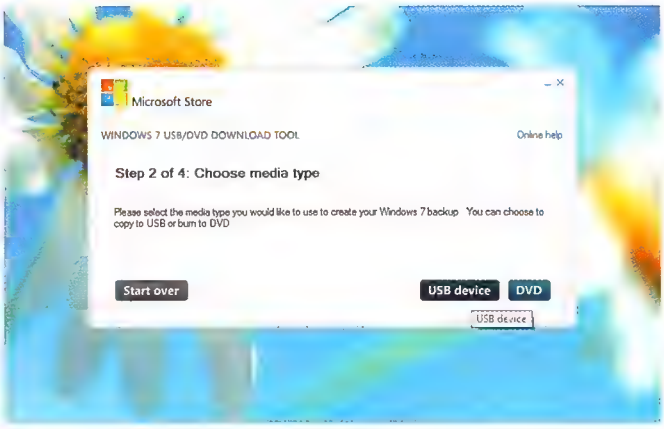
- To install the software, you may make one copy of the ISO file on a disc, USB flash drive, or other media.
- After you've installed the software and accepted the license terms that accompany the software, those license terms apply to your use of the software. The license terms for Windows 7 permit you to make one copy of the software as a back-up copy for re-installation on the licensed computer. If you do not delete your copy of the ISO file after installing the Windows 7 software, the copy of the ISO file counts as your one back-up copy.

If you need to download the software again, you can go to your Download Purchase History in your Microsoft Store account and access the download there.



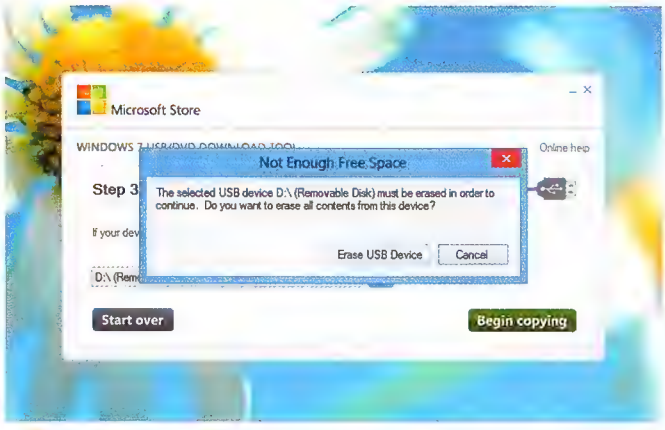
3 OPEN THE USB INSTALLER

Follow the prompts to install the Windows 7 USB/DVD download tool, and once it's installed, look for a new icon that appears on your desktop immediately afterwards. Double-click this icon to launch the USB installer.



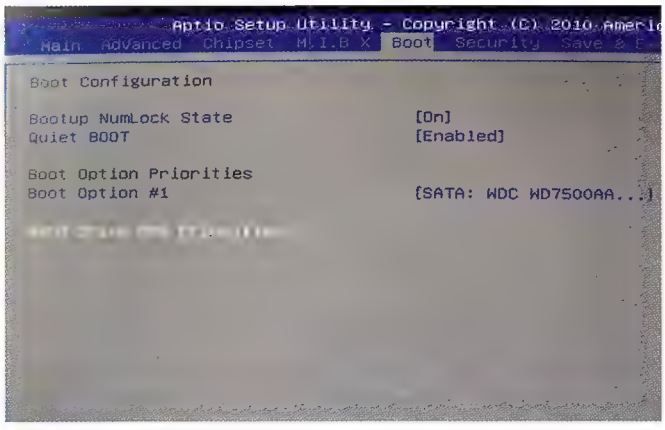
4 ISO HUNT

Hit the 'Browse' button and search for the ISO file you've just stored on your hard drive. Double-click to open it and hit 'Next'. Now choose the type of media it should be installed to – in this case, 'USB device'.



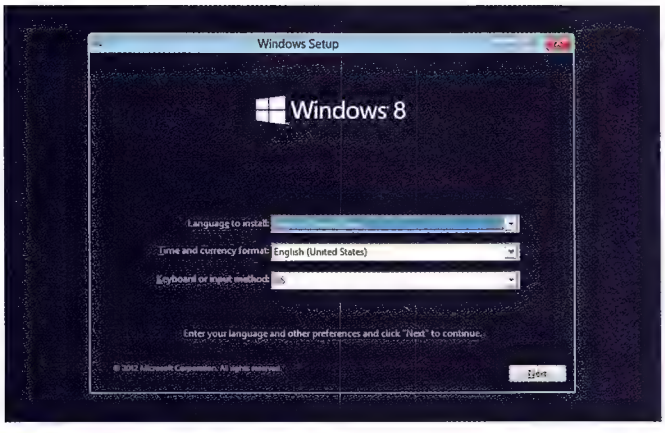
5 FORMAT AND INSTALL

Now, simply select the USB drive you've plugged in and hit 'Begin copying'. If the drive has anything on it, you'll be prompted to format it. Select 'Erase everything' if you're happy to proceed and your USB installation will begin. Once it's finished, you can try booting from it.



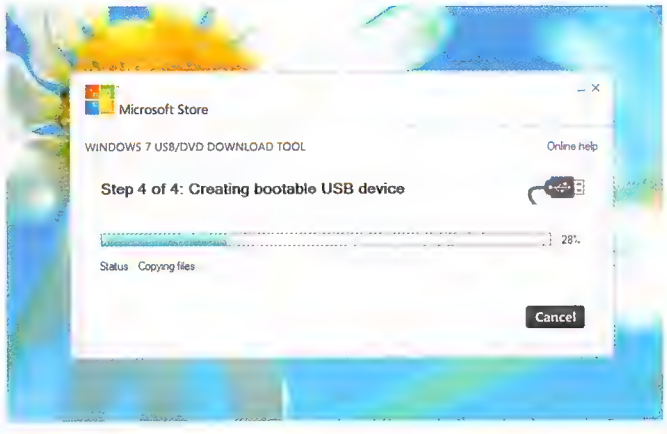
6 BOOT ORDER PRIORITY

Restart your PC and look for the prompt on screen that allows you to get into your BIOS to change the boot order of your machine. In our case, we just needed to press Del. Once you've accessed the BIOS, move across to the 'Boot' tab using the arrow keys, then move down to the 'BBS priority' option, hit Enter and change the boot order to begin with the USB drive you've inserted. The second boot order automatically changes to your main hard drive.



7 WINDOWS 8 INSTALLATION

Once you've got your boot priorities in order, hit Esc to get back to the main menu, then use the arrow keys to move across and hit 'Save and Exit' (or press F10), and you'll leave the BIOS. Your PC should now boot from the USB stick. From here, you can begin a boot reinstall.



8 EASY REINSTALL

Congratulations! If you ever have a problem that prohibits you from starting your Windows 8 machine, there's now an easy way to reinstall the OS or repair your machine. It's also handy to have around in case you lose your installation DVD (or if you never even had one).

Run Android 4.3 on your PC

Can't get the latest Jelly Bean OS for your smartphone or tablet? Run it right now on your PC instead! Darren Yates shows you how.

Just about everyone is clamouring to get hold of the latest Jelly Bean release for their Android device. You can run Android 4.3 on your PC now by downloading and installing a special x86 version of the OS. With a few tricks, you can have root access, play 1080p movies and even play games like *Angry Birds* and *Beach Buggy Blitz*.

HOW IT WORKS

The team at Android-x86 (**android-x86.org**) took Google's Android 4.3 source code and compiled it into a finished ISO image designed to run on standard Intel and AMD x86-architecture CPUs. While it might be classed only as a test build, we've had Android-x86 4.3 running on a dual-core laptop for the last week and despite the occasional glitch, it performs incredibly well.

INSTALLING IT ON REAL HARDWARE

While you can run Android-x86 4.3 on any Windows, Linux or Mac OS X computer using virtualisation software, you'll see the OS at its best running on real hardware. For our test this month, we loaded it on a three-year-old HP Compaq Presario CQ42-136TU 14-inch laptop with a 1.9GHz dual-core Intel Celeron T3100 CPU and integrated graphics. This was an entry-level laptop when it was released back in 2010 and for much of the last year, it's been holding up a bookshelf, so it's not exactly latest generation.

The first key feature of Android-x86 4.3 is that it comes as a live installable distro. That means you can burn it to a CD-R disc or load it onto a 1GB or larger USB flash drive and use it right away. You can also choose to install it onto the system hard drive and it's here that Android-x86 4.3 really shows its wares.

Rather than just kill off the Windows 7 installation running on that laptop's 250GB hard drive, we replaced the drive with an old 64GB OCZ Vertex 2 SSD. A 64GB SSD isn't large enough to house a Windows 7/8 system with too many apps, but it's perfect for Android 4.3 and gives more than enough fast and cheap storage.

We've detailed our installation process in step-by-step guides in this article: creating the Live USB flash drive, using it to install the OS onto the computer's hard drive/SSD, implementing root access and finally, tricking Google Play into installing apps it doesn't want to install.

We found the install process relatively painless and we had GPU acceleration, sound, Wi-Fi and even the onboard webcam all working straight off the bat. The most surprising aspect of the OS was just how quick it was — sure, having an SSD certainly helped load times, but it definitely felt quick.

WARNING!

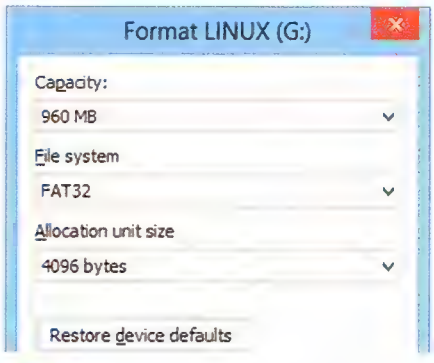
This information is provided for educational use only. None of the apps mentioned here come with a warranty. While we've tested them and they appear to work perfectly well, you're on your own if you [illegible] guarantee that Android-x86 4.3 will [illegible] your mileage may vary.

ANDROID ON PC? SERIOUSLY?

We think Android could well be the perfect OS to run on old PC hardware for a number of reasons. First, since it's a lean OS designed to run on low-power ARM-class chips, any dual-core or better x86 desktop CPU from the last six years or laptop chip from the last four should have no trouble eating it up. Second, the OS weighs in at just 430MB, which is tiny by Windows standards,

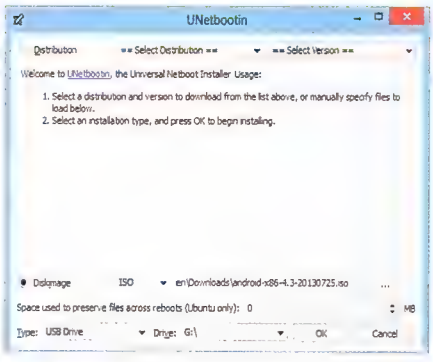
Step-by-step: Create a Live USB drive

Put the Android-x86 4.3 operating system installer on a USB key.



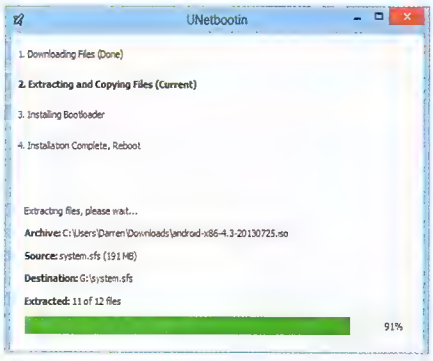
1 DOWNLOAD THE ANDROID ISO

Download the Android-x86 4.3 ISO image from **tinyurl.com/l5zoflw** onto your PC and grab the latest version of UNetbootin from **tinyurl.com/4tzan5**. Plug in a 1GB or larger USB flash drive. Save any important files and format it.



2 LAUNCH UNETBOOTIN

Launch UNetbootin and make sure your flash drive appears in the 'Drive' list at the bottom of the UNetbootin window. Click the button next to 'Diskimage', click the '...' browse button on the far right and select the location of your ISO image.

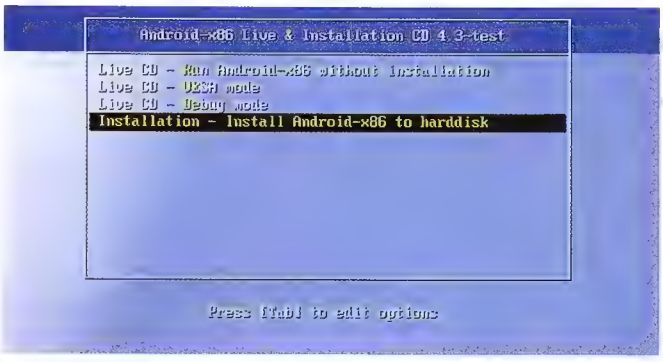


3 CREATE THE BOOTABLE DRIVE

With the ISO image and USB flash drive selected, click the 'OK' button and UNetbootin will create your bootable Android Live USB flash drive.

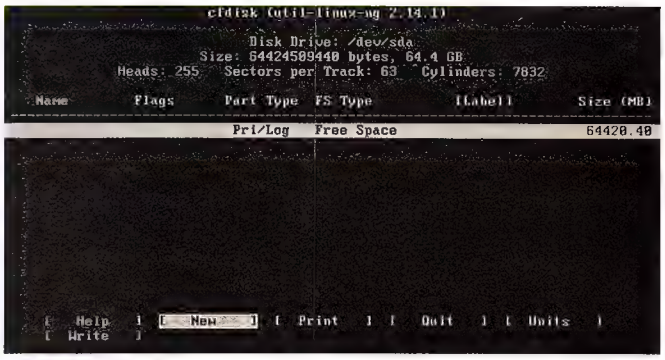
Step-by-step: Install Android on your PC

Warning: this process wipes the contents of your PC's hard drive.



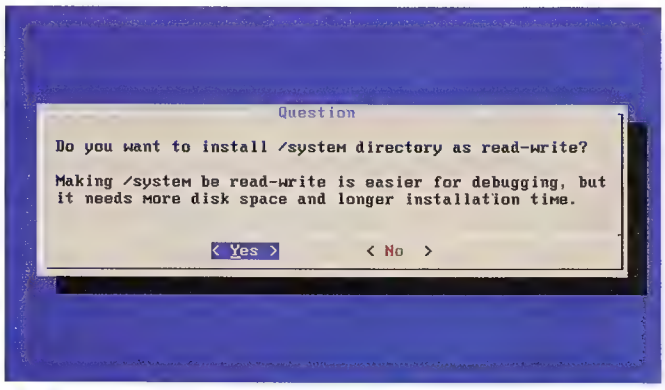
1 BOOT UP

Boot your PC from the Live USB drive you just made and select 'Installation' from the menu.



2 CREATE A PARTITION

On the 'Choose Partition' screen, select 'Create/Modify Partitions' to launch the cfdisk utility. If there are any existing partitions, use the right arrow key, scroll to 'Delete' and press Enter. Repeat until all partitions are removed. With no partitions shown, select 'New > Primary'. Press Enter again to use the full drive capacity and again to make the partition bootable. Scroll across using the right arrow key until you get to 'Write' (it auto-wraps), press Enter, type `yes` to confirm and press Enter again to write the partition. When you see the main menu again, scroll to 'Quit' and press Enter.



3 INSTALL BOOT LOADER

On the 'Choose Partition' screen again, select 'sda1 Linux' and press Enter. On the 'Choose Filesystem' screen, select 'ext3' and press Enter. Select 'Yes' to confirm. When you see 'Install boot loader GRUB', choose 'Yes'. You'll then be asked if you want the '/system' directory as 'read/write'. Again, select 'Yes'. Once the OS is written, choose 'Reboot' and remove the USB flash drive from your PC.

4 FOLLOW THE PROMPTS

Android 4.3 should now boot up on your PC. You don't need to do anything until you see the Android 'Welcome' screen. From then on, just follow the prompts.

and makes our 64GB SSD surgery a very worthwhile procedure. Third, Android 4.3 comes with TRIM support so SSD use isn't a problem. To top it off, you also get access to hundreds of thousands of apps through the Google Play app that's baked into the OS. What's not to love?

PERFORMANCE TESTS

To put a number to the perceived speed and its performance into some context, we bench tested the laptop with Geekbench 2 for a score of 2,116 – that's faster than Google's Nexus 4 smartphone rating of 2,031. On AnTuTu, the laptop scored 19,301, again higher than the 18,096 score officially shown for the Nexus 4.

Exceeding a Qualcomm Snapdragon S4 Pro quad-core CPU's level of performance using a three-year-old dual-core Celeron chip isn't a bad result by any stretch. And you can all but guarantee better performance if you're using a newer laptop.

The one area where our CQ42-136TU fell behind current mobile processors is graphics, where its GFXBench 2.5 score on the Egypt HD offscreen test was only 8.1fps. That's a tough test and given the Celeron T3100 uses 2008-vintage GM45-chipset graphics, it could've been worse. In practice, however, game favourites like *Angry Birds* and *Beach Buggy Blitz* are perfectly smooth to watch and play.

ADDING ROOT ACCESS

If you're going to go to the trouble of installing Android on a PC, the one feature you'd like to think was already available is root access. Unfortunately, it's the one feature missing from the July 25 ISO build (the latest available at the time of writing). However, there's a relatively easy fix for this – all you need is a root script available from **xda-developers.com**. We've included the details in the step-by-step guide on the following page, but in essence, you just need to use the Alt-F1 (root) Android shell to launch the script, run it once and you'll have full root access.

However, here's the rub: the script installs the Superuser root access 'allow or deny' manager app, but following that, Superuser never asks to allow or deny any root-requesting app. It just seems to automatically grant access regardless, which isn't ideal. Until a fix appears, the options are to just steer clear of root access or use it with a temporary Google account. Or if you're sure about the apps you install, use root access anyway. Since it knocks a big hole in Android's security anyway, the assumption is you know what you're doing and the possible consequences of enabling root access.

APPS TO INSTALL

Once you're up and running, head to Google Play and start downloading these free apps to really improve your Android PC experience.

- MX Player (video player)
- MX Player x86 codec pack (hardware acceleration)
- ES File Explorer (file manager)
- Root Checker (check for root access)
- USB OTG Helper (mount NTFS/exFAT external storage, root access)
- Rotation Locker (lock screen rotation to landscape)

USB OTG Helper is an awesome app that supports mounting NTFS and exFAT volumes onto an Android device. It's great if you have your movie library stored on an NTFS-formatted external hard drive, for example. USB OTG Helper will mount it and you'll be watching movies in no time. It does need root access, though, so make sure you run through the root access step-by-step guide first.

And since some apps take over the screen orientation and force it into portrait mode, Rotation Locker can override the orientation request, locking your screen into landscape mode.

HP's Compaq Presario CQ42-136TU runs Android-x86 4.3 with Wi-Fi, sound and GPU acceleration.

ANDROID-X86 GAMING

If you really want to see just what your Android PC can do, give it some gaming action. While this ROM might be only test grade, it has two important features that make gaming possible: hardware acceleration for AMD Radeon and Intel HD Graphics, plus an ARM Translator, which turns native ARM instructions into something x86 chips can understand.

In fact, there's only one problem to solve: Google Play's propensity to block app access to devices that don't match the developer's play list, and x86-based systems don't naturally feature highly on that list. The solution is an app called Market Helper. Its job is to temporarily make your Android PC look to Google Play like another more Android-friendly device, like a Samsung Galaxy S III smartphone, for example. With this sleight of hand in place, you can then download anything that's designed to run on that device, including a host of games. However, it needs root access.

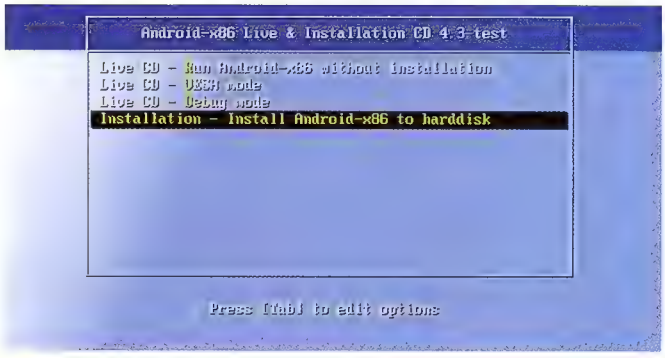
We installed *Angry Birds, Guns'n'Glory: WW2, Beach Buggy Blitz* and *Shine Runner* on our Android-x86 4.3 build and they all worked perfectly, but *Real Racing 3* and *AirAttack HD* failed. Since few Android devices can play every available game anyway, we're still pretty happy with that strike rate.

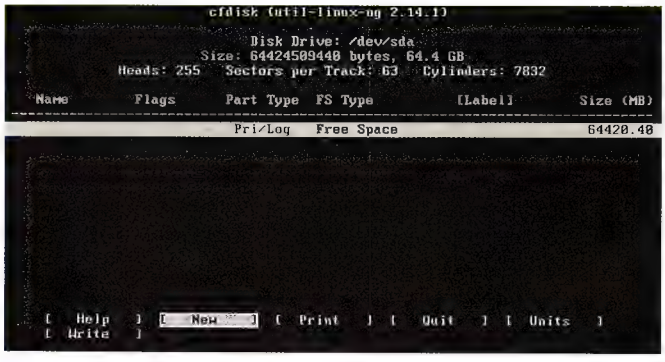
GAMEPADS

Getting USB gamepads to work on Android devices can be a bit hit and miss, although we had no trouble with Logitech's Gamepad F310 or Sony's DualShock 3 controller connected via USB and working on *Beach Buggy Blitz*. As our laptop doesn't have Bluetooth, we couldn't test the DualShock 3's Bluetooth connectivity, but we think that with root access and the Sixaxis app from Google Play, there's every chance it could work, provided the Bluetooth adapter is detected and drivers are available.

Step-by-step: Add root access

Warning: while this script installs the Superuser root access manager app, it doesn't appear to work — it doesn't ask you to allow or deny an app root access and simply grants access automatically. Use with caution.





1 EXTRACT THE ZIP

Head to **tinyurl.com/rootscript** and download the script ZIP file to your Android PC. Download and install ES File Explorer from Google Play and use it to extract the contents. Once that's done, you should end up with a folder at path '\sdcard\Download\Android-x86-RootScript-4.3'.

2 ADD ROOT

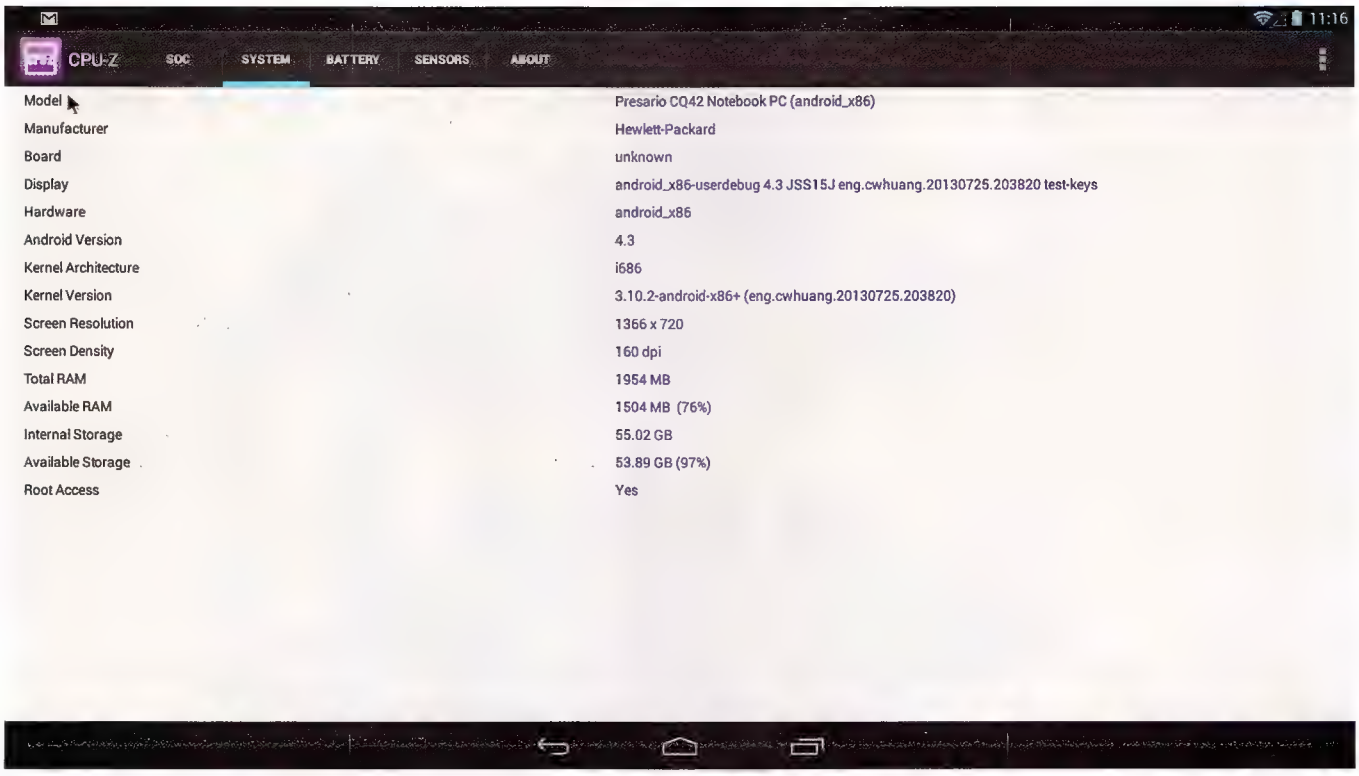
Press Alt-F1 to bring up the root shell and change directory with the following command:

```
cd /sdcard/Download/Android-x86-RootScript-4.3
```

Then run the root script by running the following command:

```
sh install.sh
```

Follow the prompts. The process takes no more than 10 seconds and will reboot your PC.



CPU-Z runs happily on this x86 build of Android, even on a 64GB SSD.

SO WHAT DOESN'T WORK?

Since Android doesn't normally have to deal with internal optical drives, Android-x86 4.3 didn't know what to do with the laptop's DVD drive. A USB-connected drive should work, but don't expect DVD movie playback. The closest you'll get is ripping the movie as an ISO image and playing it with the free Wondershare Player from Google Play. While we could capture still images with the built-in webcam, video capture was beyond the dual-core Celeron CPU's capabilities – it works, although only at a very low frame rate, likely caused by the ARM translation overhead.

As for apps that don't work, the most notable is the official Chrome browser. However, the problem seems minor: the DNS lookup mechanism doesn't appear to work. You can type in the fixed IP address – for example, **http://18.62.0.96** will take you to the Electrical Engineering and Computer Science Department at MIT (**www.eecs.mit.edu**) – but type in the hostname and it bombs out. Meanwhile, the standard Android OS browser works perfectly well.

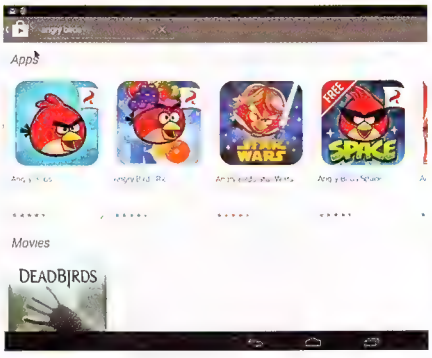
GIVE IT A SHOT

Sure, Android-x86 4.3 isn't perfect, although the one thing that really surprised us with running it on our old Compaq laptop was just how fresh it made it feel. Having the SSD helped, too, no doubt, but the whole thing was fast and responsive. Best of all, if you have an Android device already, the learning curve isn't steep. ■

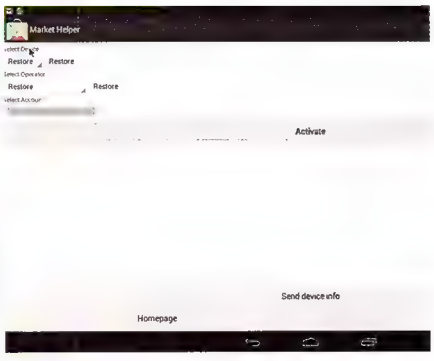
Step-by-step: Fake a device on Google Play

Trick Google Play into thinking your PC is an Android device.

1 DOWNLOAD MARKET HELPER
Download Market Helper from **codekiem.com/market-helper/latest** onto your Android PC (requires root access), install it and launch it. Change the 'Select Device' options to 'Phone', 'Samsung Galaxy 3' and click 'Activate'.



2 REBOOT
Follow the link to your 'Google Dashboard' page and click on the Android devices list to register the change. Next, reboot your Android PC, go into Google Play and *Angry Birds* should now be available to install on your device.



3 RESTORE
Relaunch Market Helper, change the 'Select Device' options to 'Restore', 'Restore' and click the 'Activate' button. Go back to the 'Google Dashboard' page to update and reboot. Your Android PC will be restored back to its original device type and name settings.

masterclass

» PC BUILDER

Break free of the box, spread your next PC out over your desk!

The basics of an open-air test bench

Open-air systems are great for quickly swapping parts in and out, so this month Tom McNamara walks you through the basic tenets of building and working with test benches.

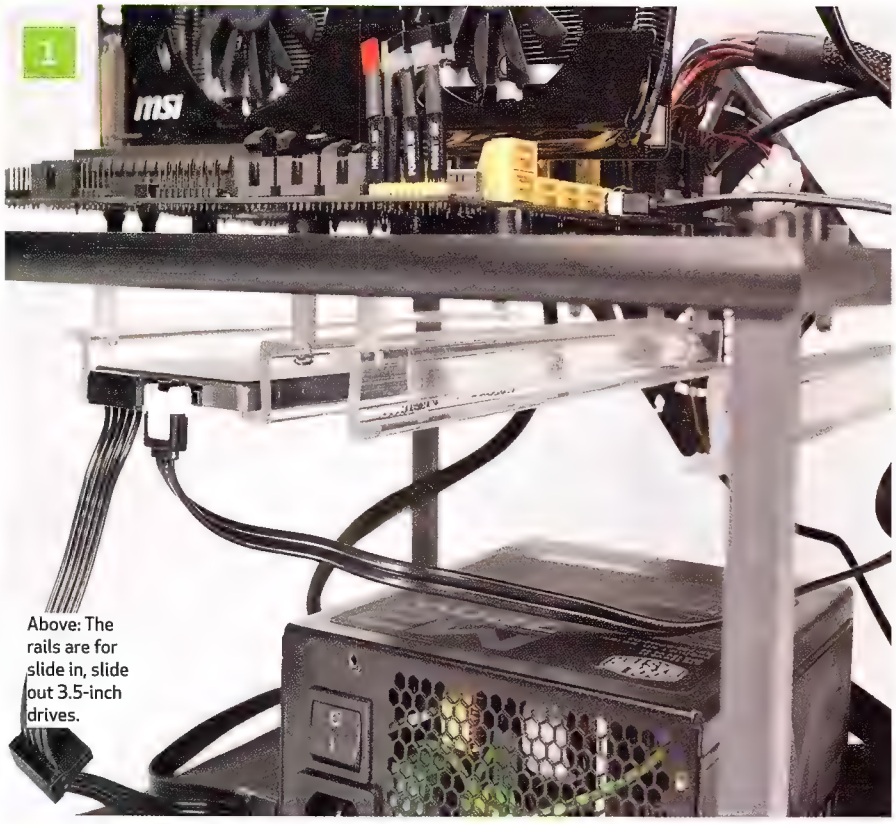
While we typically follow a standard formula for Master Builder every month, sometimes it's nice to deviate a bit from the norm and explore different types of systems that are a bit more unconventional. One such system is the type of build we use at *APC* HQ for testing hardware, known as the open-air test bench. We have several of them deployed throughout the office alongside our standard-issue desktop PCs, and both types of machines serve an important purpose.

The standard desktops are great for YouTube and Reddit, and occasional work, while the open-air test benches are used for most of our component testing since they let us swap a video card, CPU, SSD, RAM stick, or even the entire motherboard with minimal effort. When you're using an open test bench setup on top of a desk, you'll never again have to dig through the guts of your computer while on your hands and knees, with a flashlight clenched in your teeth. All you need to set up one for yourself is a basic set of spare parts, and it will let you operate like a civilized gentleperson, from the comfort of a chair, without breaking a sweat.

THINKING OUTSIDE THE CASE

There are a lot of reasons any died-in-the-wool hardware enthusiast would want to have a test bench up and running at all times. The most obvious is that it's great for quickly testing a stick of RAM, a malfunctioning piece of hardware, or benchmarking hardware outside of a system that needs to be used for productivity.

At *APC*, our bench of choice is the Top Deck Tech Station Kit made by HighSpeed PC ($140, **www.highspeedpc.com**). This is a two-tier workbench, where the motherboard sits on the upper tray, and the power supply and storage devices (or other external bay items) sit on the lower tier. The station's legs, rails, and PCI-card support brace are all made of sturdy and nonconductive materials, and the kit supports a decent amount of hardware, too. The top of the tray looks just like a standard motherboard tray in that it has rubber standoffs for clearance. A nylon guide post helps you align add-on cards with their slots in the motherboard, and a bundled neoprene mat helps prevent items in the lower tray from sliding around. In place of your case's power and reset switches, there are switches you plug into the board's front-panel connectors that allow you to turn the machine on, reboot, monitor drive activity, and hear the PC speaker. Yes, they are pricey, but very durable and able to accommodate hardware not even conceived of yet, due to their open-air design and flexibility. As always, there are several things to consider before diving in, so let's take a look at what's involved in letting your hardware go commando.



Above: The rails are for slide in, slide out 3.5-inch drives.

1 ON THE RAILS

Storage devices slide into rails pre-installed on the underside of the upper tray, and they only accommodate 3.5-inch drives. The rails also have no holes for drive screws, by design – you just slide the drive in, then slide it out when you're done. If you want to install an SSD, you'll need to order a 2.5-inch rail kit separately at **HighSpeedPC.com**. Or you can skip the adapter, since SSDs don't need to be near the 120mm fan that cools the devices in that area, and since they have no moving parts they don't need to be stabilised at all times like a spinning hard drive. The rails are long enough to support two 3.5-inch drives, and we put SSDs on the lower tray dangling from their SATA power cables.

2 MORE ABLE CABLES

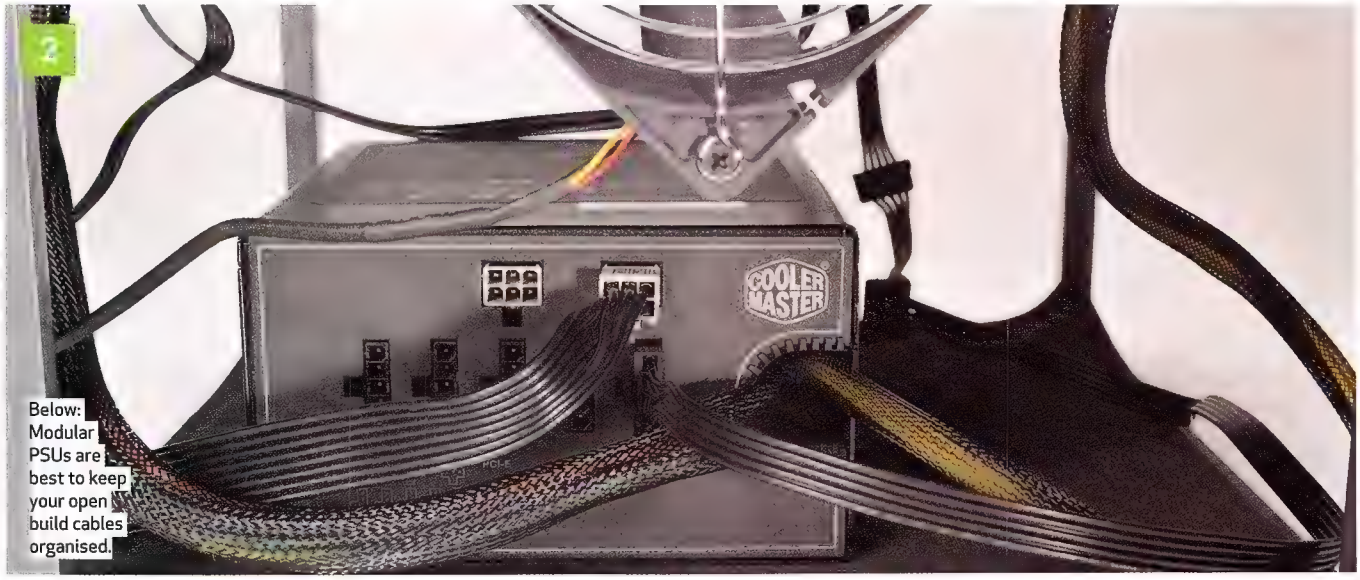
A modular power supply is extremely useful when trying to keep your cables organised in an open test bench. If you're not using an optical drive, there's plenty of space in the lower tray alongside the power supply to store the bag that contains the unused cables. Orienting the power supply can be a little tricky, since the 8-pin CPU power cable has to go to the top of the board, the 24-pin motherboard cable goes to the side, and the SATA power cables go to the bottom. Therefore, our preferred setup is to have the cables going toward the top of the motherboard, and the AC power plug facing the bottom of the motherboard. We also recommend using a stock CPU cooler since it makes accessing the area around the CPU easier, and if you can, just use the CPU's integrated graphics since it gives you one less PCI Express power cable to deal with. If we're testing a CPU without integrated graphics, we just use an old GPU that doesn't require PCIe power.

3 PUSHING BUTTONS

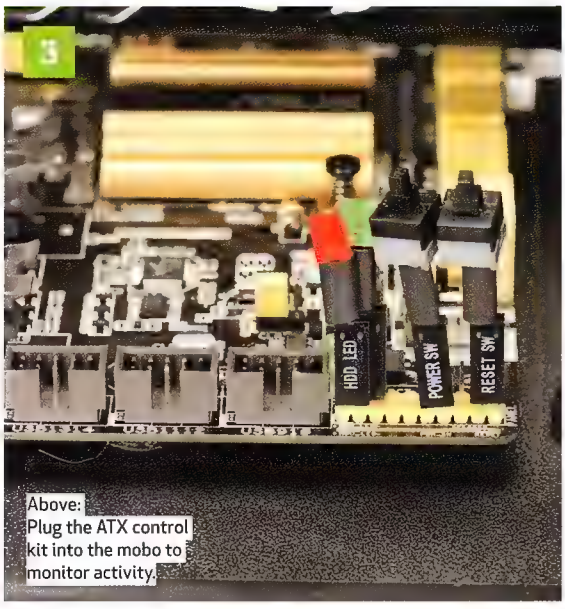
The buttons and lights on the front of an ATX case are very useful, and allow you to turn on your system, reboot it, and watch CPU and hard-drive activity. Open-air benches have similar buttons and lights – on this model it's called the ATX control kit and features a set of buttons and LEDs that plug into the motherboard's front-panel connectors. It even comes with a PC speaker, so you can hear beep codes in order to help you diagnose hardware issues (unless your motherboard has a debug LED on it, making the speaker redundant). You could always short the power-on circuit yourself with a knife blade, but this is more... dignified.

4 FEELING PINCHED

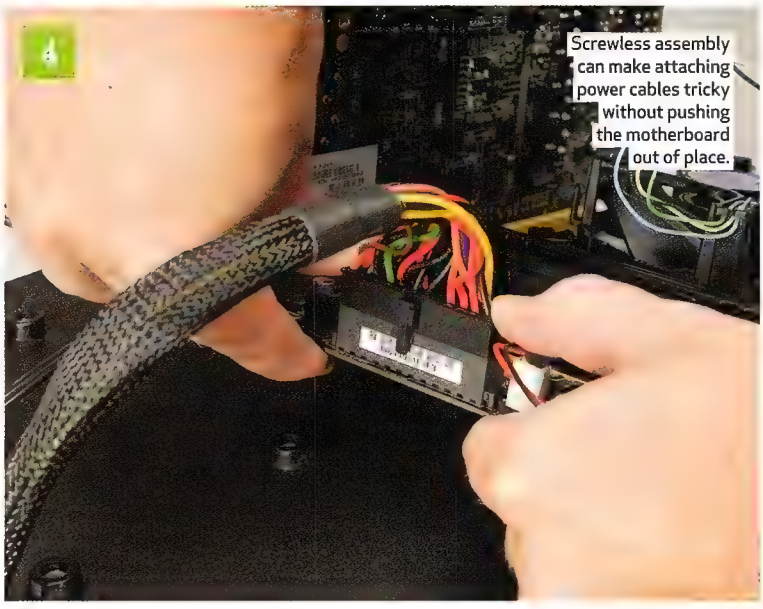
The top tray has an array of standoffs that accommodate ATX, eATX, Mini-ITX, and microATX motherboards. The standoffs sit inside rubberised feet secured with Phillips screws, so you can easily pop them out of one spot and stick them into another. No screws actually touch the motherboard, of course; it just sits on top of the rubber feet. Again, this is by design, to make it easier to swap one board for another. It does complicate plugging in power cables though, as pressing down on one edge of the board can raise the other side. When the connector is large, like with the 24-pin



Below: Modular PSUs are best to keep your open build cables organised.



Above: Plug the ATX control kit into the mobo to monitor activity.



Screwless assembly can make attaching power cables tricky without pushing the motherboard out of place.

power cable, you have to pinch the top and bottom of the board at the same time, sandwiching the connector, as shown in the photo. When the connector is small, like a USB 2.0 cable, you can just support the board from below with your hand, right underneath where the connector is going in.

5 GETTING SOME AIR

Thanks to the open design of this workbench, there are no limitations to the length of PCI cards (handy when Nvidia and AMD deliver the latest 12-inch monsters). Cards are slid into their expansion slots and secured to the support bracket with the included plastic screws. The support brace is supported by metal posts but is made of plastic to help prevent static discharge. There are a total of seven screw holes in the bracket, which should be more than enough for any mobo configuration.

Once a video card, hard drive, or RAID controller is installed, you may want to add additional cooling that would normally occur by virtue of a case's airflow, but is lacking in this setup. Your best bet is to place a 120mm fan on the top tray to move air across the components. Since the fans are easily accessible, we like being able to control fan speeds with a fan mate, which is an inline fan speed controller. HighSpeed PC also sells extension kits for mounting additional fans on the rim of the upper tray, but we've never felt the need to add that much cooling.

6 DAT MASSCOOL

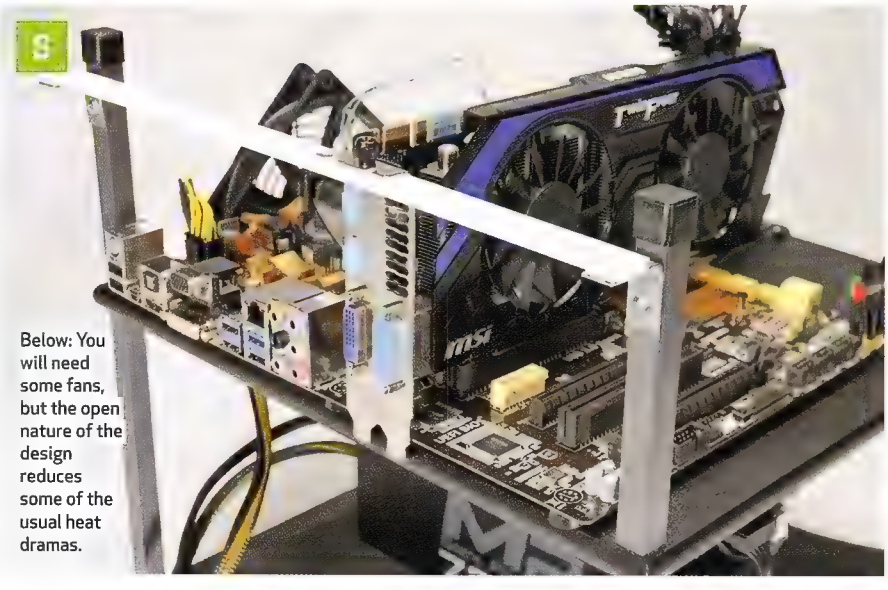
The workbench comes with a pre-installed 120mm Masscool fan with a grill that is mounted in between the bench's two tiers, so it blows air over the top and bottom of the tray, hitting the motherboard and any storage devices sitting in the rails below. The fan is universally compatible too, sporting both a 3-pin and a 4-pin Molex cable, so it'll work with any setup you have. That single fan should provide more than sufficient cooling for a basic workbench. It's surprisingly quiet, but we also use the onboard fan control in our system BIOS to make sure it's silent.

The ATX control kit is not bad, either. Each of the widgets has an embossed triangle indicating the positive wire, so connecting them is simple. It won't damage anything if you install them incorrectly; they simply won't work. Things got a bit tight on our test board when we tried to plug in the semi-stiff PC speaker widget, so we left it off. The workbench also includes an expansion bracket with power and reset buttons, but it's really cheap and its wires are a rat's nest.

FINAL THOUGHTS

It probably takes longer to assemble the workbench than it does to install all of its hardware, but once you remove a conventional case from the equation, building goes 10 times faster. You have superior lighting and there is minimal cable management to work out. We also love not having to worry about feeling crowded or lacking in space when building these rigs. There are some downsides, though. This workbench doesn't really allow liquid cooling, as there's nowhere to mount the radiator. It would also be nice to have a couple of fasteners to pin down the motherboard, and we'd love to have an SSD rail included instead of it being an expensive add-on. Also, $140 is a lot of money, but HSPC also sells a smaller ATX bench for $80 that will be fine for most users.

Probably the biggest problem with these setups is the exposed fan blades on the CPU, GPU, and chassis. We can already see a small child or a pet getting in trouble around this thing, so be sure to take precautions before deploying one in your home. ■



Below: You will need some fans, but the open nature of the design reduces some of the usual heat dramas.

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Create HTML wireframes

It's best to transfer your designs into code as soon as possible. Jared Ponchot shows how to use the Foundation framework to translate a rough sketch into an HTML prototype.

Since the early days of 3D computer modelling, modellers have used a 'wireframe' view of an object to show it in three dimensions with minimal computer processor cost. Early video games like Battlezone (my.ign.com/atari/battlezone) and Tempest (my.ign.com/atari/tempest) showed 3D objects as wireframes because early home computers weren't powerful enough to fully render 3D objects (and early one colour displays couldn't show them even if they could).

Years later, software designers and developers began referring to their sketches of what they were planning to build as wireframes as well. They were trying to accomplish the same thing the 3D modellers were: to show ideas in a low-cost way. They wanted to provide non-designers and developers with a multi-dimensional understanding of what they were designing. As the web moved from being rich text documents to being interfaces designed like software, web designers began wireframing as well.

For years, I've described my basic philosophy for wireframing using two adjectives: cheap and ugly. Wireframes should be something that you can produce quickly, and you should be able to radically change content, components, priority and layouts with little cost. Wireframes should also be as devoid of style as possible. The last thing you want clients focusing on when reviewing wireframes is the colour palette, textures, typography and imagery. If that's happening, your wireframes aren't ugly enough, or at least not low-fi enough. Wireframes aren't for testing style; they're for testing your content model, architecture, hierarchy and flows. Consider something like Style Tiles (**styletil.es**) instead if you're looking to test or establish a visual or style language with your client.

Because they were intended as an inexpensive idea-testing tool, for years, wireframes were simply pencil sketches on paper with quickly rendered boxes and squiggly lines. Eventually some of us found we could make them even faster with the copy-and-paste abilities computers afford, so we began using tools like OmniGraffle (**tinyurl.com/lcx24vz**) or Adobe Fireworks (**www.adobe.com/au/products/fireworks.html**) to speed things up even more.

Nevertheless, wireframes remained grey boxes and copied-and-pasted bits of text placed on a fixed canvas. They were low-fidelity sketches of what a web site would be.

As web site interactions became more and more complex with the advent of Web 2.0 and technologies like Ajax, as well as advancements in HTML and CSS, there was often a lack of clarity or even a degree of confusion created by these sketches of web sites.

Annotations to the rescue! Producing annotated sketches of our web sites made a lot of sense as long as the web sites themselves were also displayed at a single size on a fixed canvas.

BRAVE NEW WORLD

We've now entered a brave new world where our web sites live on a plethora of devices of various screen sizes, resolutions and interaction patterns. The fixed canvas is a thing of the past. So, what's our solution been? For the most part, we choose two to three screen sizes (which typically map to Apple's original two iOS devices and one random desktop size) and repeat the process for each. Sketch everything, annotate everything profit!

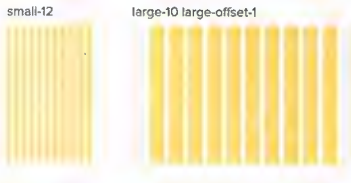
Assuming we learn a little from whichever size we start at, we should sometimes be able to do this in less than three times the amount of time as our old wireframes for just desktop devices, right? Wrong. In my experience, annotations and confusion increase with this approach. We also begin spending time creating documents that try to make sense of all the screen sizes and presenting these sketches of our web site at different sizes in a way that's easy for clients to understand and digest.

Aside from the fact that we've at least doubled our time investment in wireframing, we've also likely ignored a number of key decisions that will have to be made at some point. At times we even paint ourselves into a corner that's very difficult to develop our way out of with HTML and CSS. If our two end points are 320px wide and 1,400px wide, there are 1,080 different possible widths in between at which various content, components, or even interaction types might break. This is, after all, where we get the term 'breakpoint' from. There's an additional cost to wireframing this way, even if we think we can get our three widths wireframed more quickly than other methods.

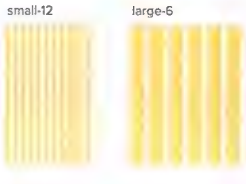
ENTER THE RESPONSIVE HTML WIREFRAME

Many designers have been afraid or unwilling to make the leap to producing responsive HTML wireframes for various reasons. What follows is a short list of some of the most common things I've heard designers say about this, and some thoughts on each. These are each very valid questions and sensible concerns, so I'll respond to each individually. I may not

Mobile first Without a set width, the large screen will inherit the small grid width

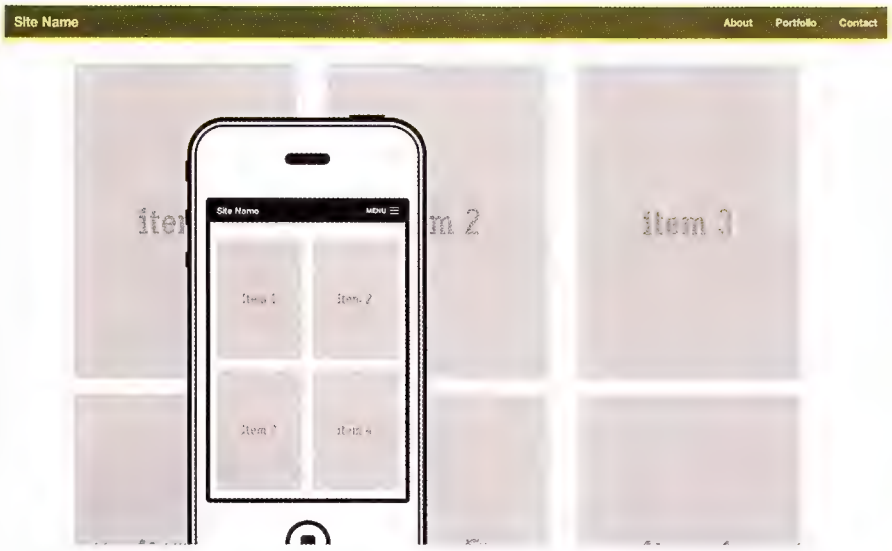


Size offset The size-offset-x class lets you choose the number of grid columns to offset



Large grid You need to specify a separate grid width for large screens

Centre/uncentre Small and large will both be centred unless using the uncentred class



Full menu The full menu across the top of large screens has the site name on the left

be able to convince you to try something new, but hopefully I can dispel a few misconceptions about what I mean when I say that one of my new deliverables in my design process is responsive HTML wireframes.

«1» ***'I've been making static wireframes with my toolset for years and have gotten crazy fast at it, I don't want to give up that speed advantage.'*** Producing HTML wireframes may indeed add time to your process from the time you begin wireframing to the point when you have client approval. However, it may well reduce additional communication and work after your wireframes are approved, since static wireframes often leave a lot of stones unturned. Additionally, as you begin wireframing for an ever-increasing number of screen sizes and interaction types, you'll likely find the need for either more wireframes, or additional annotation, which can quickly get out of hand. Maximising speed isn't the only goal in wireframing.

«2» ***'I don't think in HTML and CSS. To create layout and design ideas I need a canvas-based tool.'*** This is one of the more common misconceptions about what many people refer to as 'designing in the browser'. Though my client deliverable has become responsive HTML wireframes, I still sketch as a part of my process, and I think you often should.

«3» ***'I know HTML and CSS, but I'm no expert frontend developer. I don't have time to fight with media queries and build responsive screens.'*** The good news here is that you need not be Ethan Marcotte to begin creating responsive HTML wireframes. There are a number of frameworks out there that provide handy, reusable code so you can begin piecing together components and layouts that suit your ideas and sketches.

ENTER THE FRAMEWORK

Now, assuming I've convinced you to wet your toes in the HTML wireframing waters on your next project, let's talk about frameworks. Frameworks generally offer a built-in grid system, base styles, and pre-made, reusable components (navigation, slideshows, and so on). They also offer a community of helpful people due to their widespread use, documentation, and they've been pre-tested in various browsers. There are several frameworks out there, each with their pros and cons. Here's a list of just a few:

- Bootstrap (**getbootstrap.com**)
- Foundation (**foundation.zurb.com**)
- Wirefy (**getwirefy.com**)
- Skeleton (**www.getskeleton.com**)

I've chosen Foundation to provide you with a quick walkthrough for creating a responsive HTML wireframe because it's popular, it's mobile-first, it's optionally semantic (meaning you can concern your class-based assignments to being semantic using Sass), it has lots of pre-made templates and components, and it's under active development. Basically, it's one of the simplest frameworks to get your head around that also could be used to turn your wireframes into an end product.

"MAXIMISING SPEED ISN'T THE ONLY GOAL IN WIREFRAMING"

BEFORE YOU BEGIN

Just because we're working to produce HTML wireframes to show our client doesn't mean we can't or won't still sketch: just that producing a sketch and annotations for every possible screen type and each size variation is no longer necessary. For this exercise, I've produced a quick sketch of what we're aiming to produce. It's a wireframe for a homepage of an artist's portfolio web site.

- Download the wireframe built with Foundation: **apcmag.com/wire395**

GETTING STARTED WITH FOUNDATION

To create your first wireframe using Foundation you can simply go to **foundation.zurb.com** and click on the download link. You'll arrive at a page that provides an array of options to custom tailor your package, but for the purpose of this example we'll just click the Download Foundation CSS link and away we go. The other useful URLs are Foundation's documentation page (**foundation.zurb.com/docs**) and templates page (**foundation.zurb.com/templates.php**) for ready-made samples you can reuse in your wireframes. Once the ZIP file has

Get real

The Agile Manifesto states: "Working software always trumps documents about working software." Aside from the fact that your static wireframes will likely cost you more in time and communication (as well as the fact that there are frameworks available to make HTML wireframing much speedier than it might have been), the ultimate reason to consider making HTML wireframes is to more quickly make something resembling the real end product.

As 37signals (**37signals.com**) says in its book, *Getting Real* (**gettingreal.37signals.com**), "Getting real delivers better results because it forces you to deal with the actual problems you're trying to solve instead of your ideas about those problems. It forces you to deal with reality."

If it's possible to make a wireframe that works in a browser and responds appropriately at any screen size, it may well be worth it, even at some additional cost.

downloaded, unzip it into whatever folder on your system you want to store your wireframes in, and then retitle the folder to something meaningful, for example, acme-project. When you open the folder, inside you should see a help.html file, an index.html file, a humans.txt file, a robots.txt file, and folders for CSS, images and JavaScript. Open the index.html file and use it as your starting point. You can simply delete all the sample content within the body tags. This will give you your basic page structure you need ready to go. The important things to note if you're making your own .html file are listed below:

- Add the normalize.css to your head:
```
<link rel="stylesheet" href="css/normalize.css" />
```
- Add the foundation.css to your head:
```
<link rel="stylesheet" href="css/foundation.css" />
```
- Add modernizr.js to your head:
```
<script src="js/vendor/custom.modernizr.js"></script>
```
- Add the jQuery and various foundation scripts to the end of your document body (see the sample index.html file for these).

THE FOUNDATION GRID SYSTEM

The first and likely most important thing you'll want to understand to begin using Foundation is its grid system. It's a 12-column grid, is completely nestable and fluid, and you can work really fast by assigning grid widths by simply adding a class to an item (for example, class="small-12 large-8 columns").

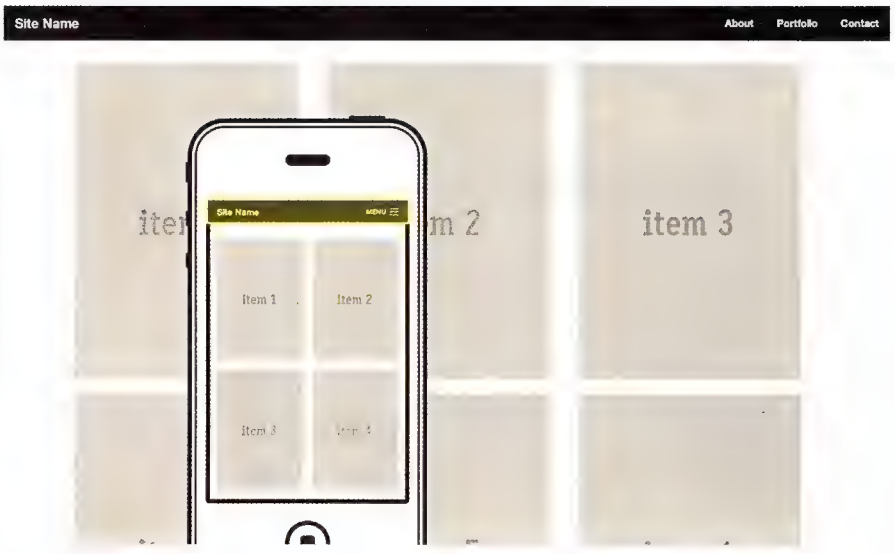
When using the grid to assign a width to an element, you can assign a width for both small and large screens (the two default 'breakpoints' built into Foundation). x is the number of grid columns assigned. For example, on a small screen, small-x columns or on a large screen, large-x columns. You can create a new instance of the grid by using the row class on a wrapper element. So, in the example below, we have an element that should span the full width on small screens, and only half of the width on large screens.

```
<div class="row">
<div class="small-12 large-6 columns">...</div>
</div>
```

In our example wireframe we've sketched above, we have a legal text area that spans the full width on small screens, but only half on large screens. This would be accomplished as follows:

```
<div class="row">
<div class="legal small-12 large-6 columns">...</div>
</div>
```

It's also worth noting that, since Foundation's grid is mobile-first, the small grid width is the only one you're required to assign. If you only assign a small width, the large screen size will simply maintain or inherit the small assignment. In the example below, the element would have a width of eight columns on both small and large screen sizes.



Menu icon A menu icon link allows the user to tap to reveal a menu on small screens

```
<div class="row">
<div class="small-8 columns">...
</div>
</div>
```

Also, by using simple classes, you can do things like offsetting, centering, and pushing or pulling to design against source ordering. In the following example the element would span the full width on small screens, but on large screens it would span 10 columns, but do so for columns 2-11.

```
<div class="row">
<div class="small-12 large-10 large-offset-1 columns">...</div>

</div>
```

In the following example, the element would span the first nine of 12 columns on small screens. On large screens, it would span the width of nine columns but be centered.

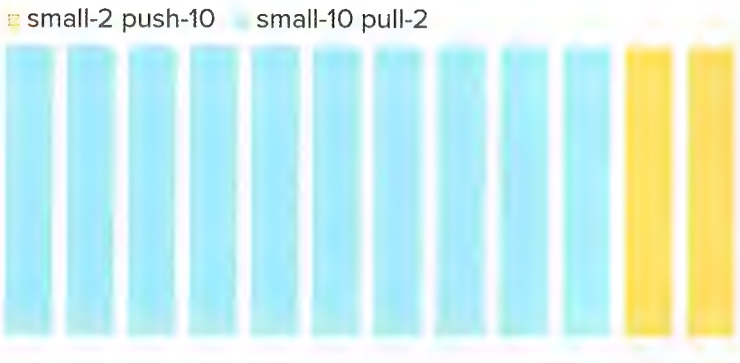
```
<div class="row">
<div class="small-9 small-centered large-uncentered columns">...</div>
</div>
```

In the following example, the first element would span the last two of 12 columns, while the second element would span the first 10 of 12 columns.

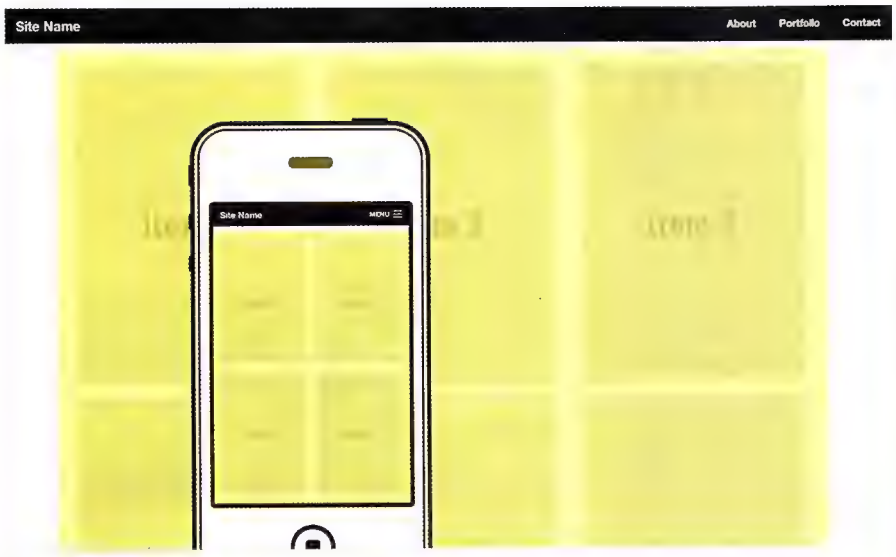
```
<div class="row">
<div class="small-2 push-10 columns">2</div>
<div class="small-10 pull-2 columns">10, last</div>
</div>
```

SETTING UP NAVIGATION

Foundation has a few different navigation patterns already pre-baked for you to use within your wireframes. Our wireframe shows a navigation menu



Push/pull. Using push-x and pull-x, you can alter the presentation order of the grid.



Block grid Large screens show three items per row; smaller screens show two.

at the top of the screen that contains the site name and shows a simple menu link on small screens. Thankfully, there's a pre-baked navigation component that matches that description in Foundation. Below is an example of how to achieve this. At the top of our body, we'll add the following.

```
<nav class="top-bar">
  <ul class="title-area">
    <li class="name">
      <h1><a href="#">Site Name
</a></h1>
    </li>
    <li  class="toggle-topbar
menu-icon"><a
href="#"><span>Menu
</span></a></li>
  </ul>
    <section  class="top-bar-
section">
      <ul class="right">
        <li><a  href="#">About
</a></li>
        <li><a href="#">Portfolio
</a></li>
        <li><a href="#">Contact
</a></li>
      </ul>
    </section>
</nav>
```

Let's break down how we achieved the navigation style we had in mind.

«1» Create a nav element and add the class top-bar to it.

«2» Create an ul element with the class title-area to contain our site name and the small screen menu toggle.

«3» Add our site name as a h1 within the first li element in our title-area ul, and add the class name to it.

«4» Add another li with the class name toggle-topbar to contain the menu toggle link for small screens.

«5» Add the class menu-icon to the toggle-topbar li so that the menu link on small screens shows the menu icon.

«6» Create a section element with the class top-bar-section to contain the actual menu ul.

«7» Within the top-bar-section create a ul with a class of either right or left (depending upon our preferred menu alignment). This ul will contain our list items with menu links.

CREATING OUR BLOCK GRID

Our wireframe sketch then shows a grid view of portfolio items that is two items wide on small screens and three items wide on large. Foundation makes block grids like this quite simple by providing a pre-baked small-block-grid-x and large-block-grid-x class that can be used on any ul element. To produce our block grid list of portfolio items we'll use the following markup.

```
<div class="row">
  <div class="small-12 columns">
    <ul class="small-block-grid-2
large-block-grid-3">
      <li><a href="#"><img src=
"http://placehold.
it/290x410&text=
item+1"></a></li>
      <li><a href="#"><img src=
"http://placehold.it/290x410&text
=item+2"></a></li>
      <li><a href="#"><img src=
"http://placehold.it/290x410&text
=item+3"></a></li>
      <li><a href="#"><img src=
"http://placehold.it/290x410&text
=item+4"></a></li>
      <li><a href="#"><img src=
"http://placehold.it/290x410&text
=item+5"></a></li>
      <li><a href="#"><img src=
"http://placehold.it/290x410&text
=item+6"></a></li>
    </ul>
</div>
</div>
```

Things to remember

You can see that we've very quickly produced a basic, working, responsive HTML wireframe. Here's some of my top advice for taking it even further:

STAY ORGANISED

Make sure that you stay organised with meaningful class names. It's very easy to get sloppy and only use the grid and Foundation-related classes on elements. This is a challenge when your wireframe is more complex.

DON'T GET CARRIED AWAY

Don't be tempted to create complete prototypes rather than simple wireframes if elements aren't pre-baked into the framework, especially for complex interactive elements. Instead, consider sketching the idea and pitching if first before you burn time and effort building a crazy navigation approach only to have it shot down. We want wireframing to be low cost and have a culture of experimentation and iteration.

USE PLACEHOLDER IMAGES

For quick results, you always have the option to drop in a placeholder sketch as an image into a HTML wireframe. There are a number of free services out there for doing this. In this example, I used placehold.it (**placehold.it**), which allows you to assign the width of the image and even add some custom text to describe what the image is.

FAKE IT TO MAKE IT

Don't be afraid to fake things to help communicate an idea.

You'll notice we first defined a row wrapper and then a container set to span all 12 columns. We do this so that the block grid doesn't stretch all the way to the edge of the screen, but rather maintains the same padding and max-width as the rest of our items defined within our grid.

I hope you feel empowered to give HTML wireframing a try. This is a wonderful time to be a web designer. When having lots of tools available to us makes the things we do more elegantly effective and easier to understand. ■

Making your own ROMs

Darren Yates continues his series on how to customise your own Android ROMs using the Android Kitchen app.

Over the course of this masterclass, we've looked at how you can take an existing smartphone ROM and modify it to create your own custom ROM, showing you how to add in root-access, deodexing files and even removing corporate bloatware. So far, we've used a free Linux-based app called Android Kitchen to perform most of the dirty work for us. But the app also has an extra feature that enables you to take ROM customisation to a new level by adding in your own DOS-like scripts.

If you hark back to the age of Windows 98, one of its most useful features was the ability to run your own custom scripts on boot through the old config.sys and autoexec.bat files. You could run anything from CD-ROM drivers to your own DOS batch files as Windows booted up.

Running custom scripts might seem old-fashioned, but it's still huge today. Moreover, it's one of the most powerful tools in an Android ROM developer's arsenal. Through scripting, you can achieve all sorts of tweaks to improve everything from performance to memory management to battery life. In terms of ROM customisation, scripting is close to the ultimate option.

USING /ETC/INIT.D

Scripting is nothing new to Android because it's been in Linux since the year dot — and it essentially works the same way too. Rather than having your basic script execution files in the system drive root folder like you did with Windows, Android can be made to look for script files in a particular folder, the most common being the /etc/init.d folder. Scripts use the Linux Shell script language (sh or bash) in a similar way to DOS and its batch programming language. They launch after the kernel has finished initialising.

There are new apps appearing on Google Play and **xda-developers.com** that are starting to achieve some of the functionality of scripting — Universal Init.d, Init.d Installer and Init.d Toggler are just a few. But the great thing about scripting is that it allows you to bake your custom modifications straight into the ROM so that they run automatically.

SETTING IT UP

In order to run scripts in your Android ROM, you'll need to initialise the /etc/init.d folder — it doesn't exist normally. You'll also need to install the Busybox collection of Linux command-line apps if you've not done so already.

Assuming you've been following this series and you have your Linux PC or virtual machine set up with the Android Kitchen app installed and a working ROM folder, you can use Android Kitchen to set this up automatically. From the main menu, select '0 – ADVANCED OPTIONS' and choose '14 – Add /etc/init.d scripts support (busybox run-parts)'.

SD CARD SPEED TESTS

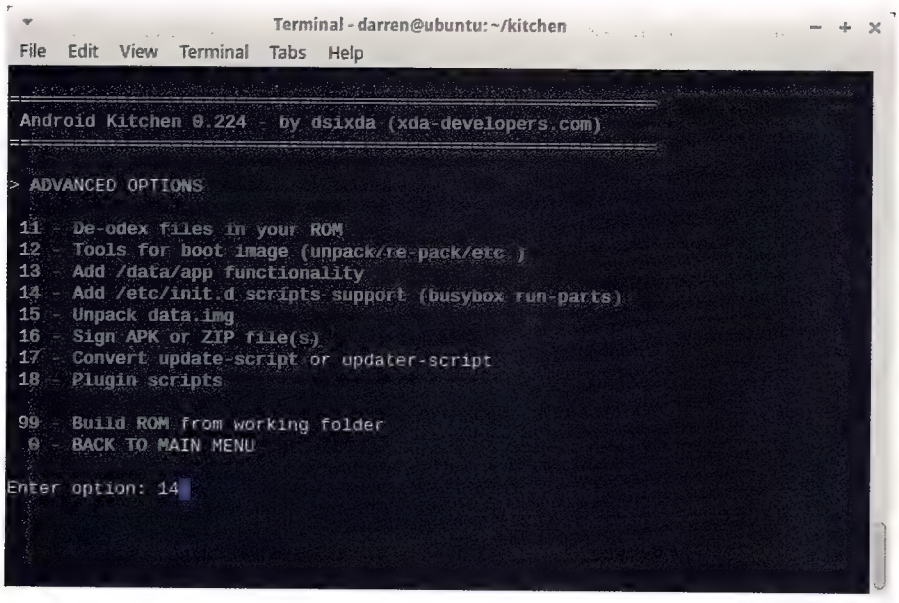
BEFORE (128KB SETTING)	A1 SD BENCH (MB/SEC)	SD CARD TESTER (MB/SEC)
WRITE SPEED	13.77	14.03
READ SPEED	13.25	12.12
AFTER (2048KB SETTING)		
WRITE SPEED	13.23	14.48
READ SPEED	25.81	21.67

Back in Part 2 of this series, we briefly looked at Busybox as an option to build into your ROM and how it provides access to a multitude of those handy little Linux applets. Run-parts is one of those applets that can launch executable files and Android Kitchen uses it here to launch your custom boot scripts.

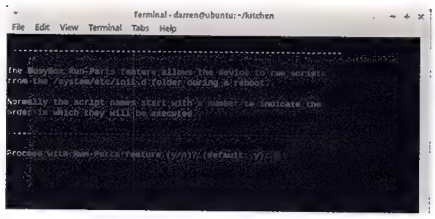
HOW ANDROID BOOTS

While Android Kitchen makes setting this up relatively straightforward, you don't want to end up as just another 'ROM jockey' so it's worth your while understanding what's happening in the background. In practice, Android Kitchen performs a number of steps to enable scripting and it's all based on how Android loads up in your device.

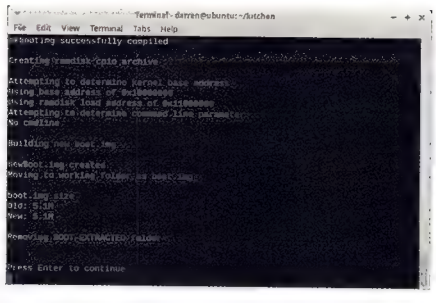
Turn on any Android device and you'll be greeted by its splash screen animation (we showed you how to make your own animation in last month's issue) but while that splash screen whirrs around, Android is loading itself into your device's memory.



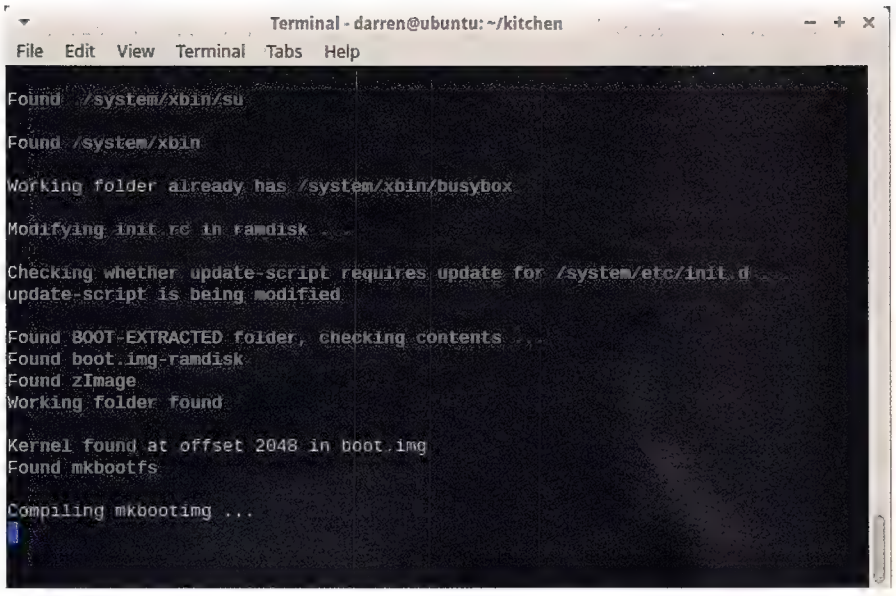
Android Kitchen helps you implement scripts — but you must write them yourself!



Choose 'yes' to enable scripts to run from the /system/etc/init.d folder.



The kitchen has to pull apart the BOOT.IMG file to insert our script redirection.



Once inserted, the BOOT.IMG file has to be stitched together again.

Very briefly, here's what it's doing.

The first thing that happens is that the main bootloader fires up and starts sorting out the basics of the device's hardware, typically RAM, wireless and other features. From there, it looks for the Android kernel, which it finds in ROM's BOOT.IMG image file. Once the kernel is loaded, the bootloader switches control to the kernel, it takes over and begins loading the RAMdisk and the root file system that also live in the BOOT.IMG file. With that done, the kernel begins to load the OS through the main initialisation script called init.rc, found in the RAMdisk. After that, the Dalvik virtual machine is setup and finally, the system server, which launches all of the top-level phone features such as Wi-Fi, telephony and so on, kicks in and takes over.

MODIFYING INIT.RC

If we rewind the process, the point at which scripts are launched is when the init.rc file is called by the kernel from the BOOT.IMG boot image. In a normal Android ROM, init.rc is locked down tight and only the processes listed in the file are loaded. But what Android Kitchen does is modify the init.rc file and create a service within it called sysinit (system initialisation), which launches Busybox and uses run-parts to launch whatever scripts are found in the /system/etc/init.d folder, using the following script command:

```
service sysinit /system/bin/
logwrapper /system/xbin/busybox
run-parts /system/etc/init.d
```

In plain-english? It's telling Android that while running the main init.rc launch script, we also want it to launch whatever scripts it finds in the /system/etc/init.d folder. The good thing is that once you've added this to the init.rc file, you don't need to go near it again to get any script you want to run. But what about handling multiple scripts?

SCRIPT EXECUTION ORDER

Android's scripting system is a somewhat simplified version of that found in Linux but just as in Linux, you can also set here what's called the script execution order. There may well be times when you want one script to run before another and you can set the order simply by how you name the script file. Android looks at the first two characters of the filename – the smaller the number, the earlier it executes.

However, this is where we get to the limit of Android Kitchen's capabilities – it doesn't write scripts, nor does it move them to the /system/etc/init.d folder for you. These are things you'll have to learn how to do yourself.

WRITING YOUR OWN CUSTOM SCRIPTS

Now that we've set up scripting functionality, what can you do with it? There are all manner of ready-made scripts you can use – in this series, we've been using the Samsung Galaxy S3 and there's a huge list of scripts over at **tinyurl.com/ma72xno**. Some of them will work with any Android OS; others will require specific modified kernels.

You can also write your own if you know how – just make sure to use a standard Linux text editor to write scripts and not a Windows-based editor. The problem with Windows text editors is they add in extra spaces and characters that can break the script. If you're using Xubuntu as your Linux distro, just use Mousepad.

With scripting, you can do anything from changing CPU performance to changing how memory works and more.

BOOST ANDROID SD CARD SPEED

One very common script is used to improve SD card performance by changing what's known as the 'read ahead' block size. You'll find this parameter is set in many Android devices to 128KB or less. However, you can achieve higher read speeds by setting it to a higher level such as 1,024KB or 2,048KB. Like most things, it's a compromise because you are now forcing Android to load up more data to fill the new 'read ahead' size, which may be wasteful if you're dealing with mainly smaller files. Whatever the case, write this change into your ROM by writing it into a script.

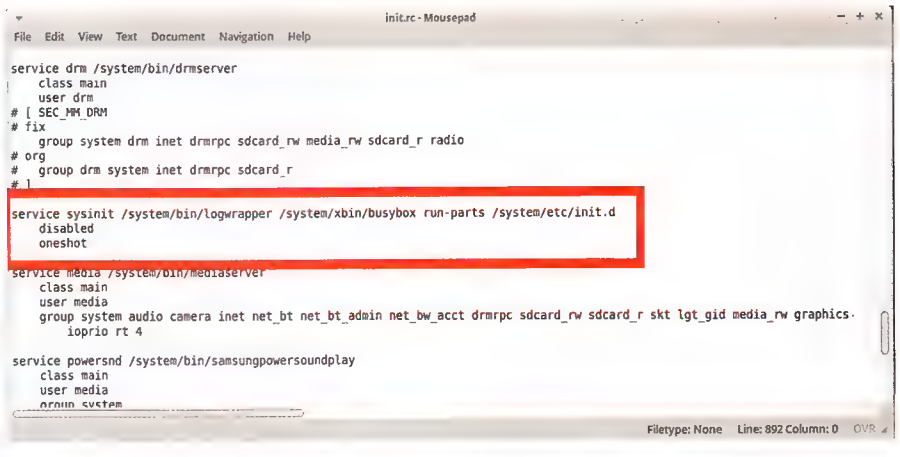
If you're making a ROM for the Galaxy S3 smartphone, you can open up a Linux text editor and type in the following:

```
#!/system/bin/sh
echo "2048" > /sys/devices/
virtual/bdi/179:0/read_ahead_kb
```

What that tells Android to do is to reset the read_ahead_kb parameter to 2,048KB. Save the file as 99sdcardfix and copy it to the ROM working folder's /system/etc/init.d directory.

If you install Terminal Emulator from Google Play on your stock Samsung Galaxy S2 or S3 smartphone for example and then type:

```
cat /sys/devices/virtual/
bdi/179:0/read_ahead_kb
```



The initial init.rc boot script with its new redirection to our folder location.

99sdcardfix - Mousepad

File Edit View Text Document Navigation Help

```
#!/system/bin/sh
echo 2048 > /sys/devices/virtual/bdi/179:0/read_ahead_kb;
```

Writing your own scripts can be simple – this one speeds up SD cards.

Filetype: None Line: 2 Column: 9

98cpufreq - Mousepad

File Edit View Text Document Navigation Help

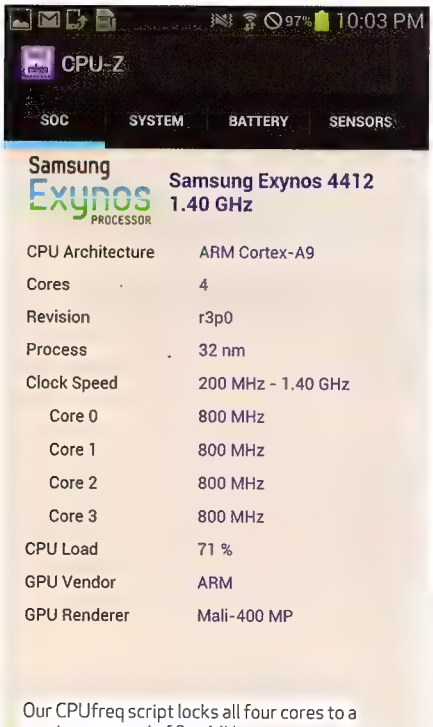
```
#!/system/bin/sh
echo 250000 > /sys/devices/system/cpu/cpu0/cpufreq/scaling_min_freq;
echo 800000 > /sys/devices/system/cpu/cpu0/cpufreq/scaling_max_freq;
```

Filetype: None Line: 4 Column: 0 OVR

The 98CPUfreq script lets you set minimum and maximum CPU core speeds.

You'll likely get a result of '128'. After you install and run the script, it should become '2048'. You can use an app like SD Card Tester from Google Play to do before/after performance tests to see the difference – just remember that while speed tests can be intoxicating, real world performance mightn't be as dramatic. While you probably won't see any write speed differences, you should see a decent improvement in read speeds, provided you're using a Class-6 or Class-10 card. In any event, this will give you a pretty decent idea of how scripts work, how to install them and get them to run automatically on boot.

If you want more than just the basics, the best way to learn is to follow in the footsteps of others. One of the best universal scripts going around at the moment is V6 Supercharger, which is a memory management script that improves the way Android handles memory. Thousands swear by its effectiveness and one of its tricks is the same that we've just performed here.



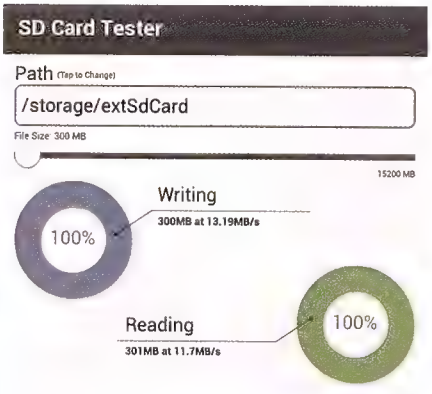
Our CPUfreq script locks all four cores to a maximum speed of 800MHz.

BEFORE AND AFTER TESTS

Just to see what difference the script actually made, we tested it with before and after tests using two benchmarks, A1 SD Bench and SD Card Tester. In both cases, increasing the read-ahead setting from 128KB to 2,048KB gave well on the way to double the read speed from our test 16GB Kingston Class-10 MicroSD card. Chances are you won't see the same gains with slower cards.

CHANGING CPU SPEED

Another script you can run is to lock down the clock speed range. Android uses what's called a 'speed governor' that automatically sets the clock speed between the CPU's maximum and minimum levels based on the software load. Our test Galaxy S3 phone's Exynos 4412 CPU has a clock speed min/max set of 200MHz/1400MHz. But you can change those levels by creating another script.



Read/write speeds on our 16GB Class-10 MicroSD card with 128KB read-ahead setting.

In the same Linux text editor, create the file 98cpufreq and type the following:

```
#!/system/bin/sh
Echo 250000 > /sys/devices/
system/cpu/cpu0/cpufreq/scaling_
min_freq;
Echo 800000 > /sys/devices/
system/cpu/cpu0/cpufreq/scaling_
max_freq;
```

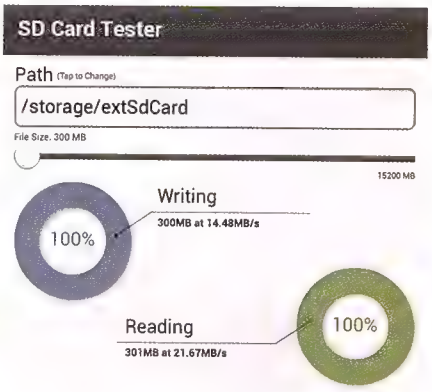
This will adjust the min/max set to 250MHz/800MHz. Copy the script to the /etc/init.d folder as before. When your new ROM is eventually installed you can monitor the CPU frequency range in real time using CPU-Z from Google Play. It'll show you the clock speed of each core in the CPU. To revert to the Galaxy S3's original settings, change the numbers above to '200000' and '1400000'.

The jury is still out on whether underclocking a CPU makes a real difference to battery life, but it does make a difference to heat production. Whichever side of the fence you sit on, we've seen that the script does work and limits the CPU speed to between these min/max settings.

DO AWAY WITH APPS!

If you head over to Google Play and look up the app SD Card Increase, you'll see that it does the same thing we did here in our first script – changing 'a parameter in the operating system' according to the notes, to let you change the look-ahead size by moving a slider. Now sure, you can bypass this whole 'customise your own ROM' idea and just use that app. But given the app does the same thing as our script, you no longer need the app.

And this is one of the keys to understanding Android as an operating system – there are plenty of tweaks around that offer all manner of improvements but many of them can be implemented by simply installing and setting up your own scripts. And by understanding how to get scripts built into the OS, you're now well on your way to creating your own high-performance Android ROM without the need for any further apps.



Increase read-ahead to 2,048KB and read speed increases significantly on fast cards.

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Combat Creatures' Attacknid drone — ripe for hacking!

Hacking the Attacknid

The popular attack robot loses its remote control and goes free-roaming. Darren Yates explains how to do it.

The only thing that will hold you back in building new gadgets out of Arduino is your imagination. But even if you're struggling to come up with a cool idea to stretch your engineering skills, there's always something else you can try – hacking existing devices.

And by 'hacking', we don't mean 'ooh, I found your password', but serious work-up-a-sweat re-engineering. In fact, you're likely to get more kudos from your mates for hacking something they know than building something from scratch they've never seen before (well, I seem to anyway).

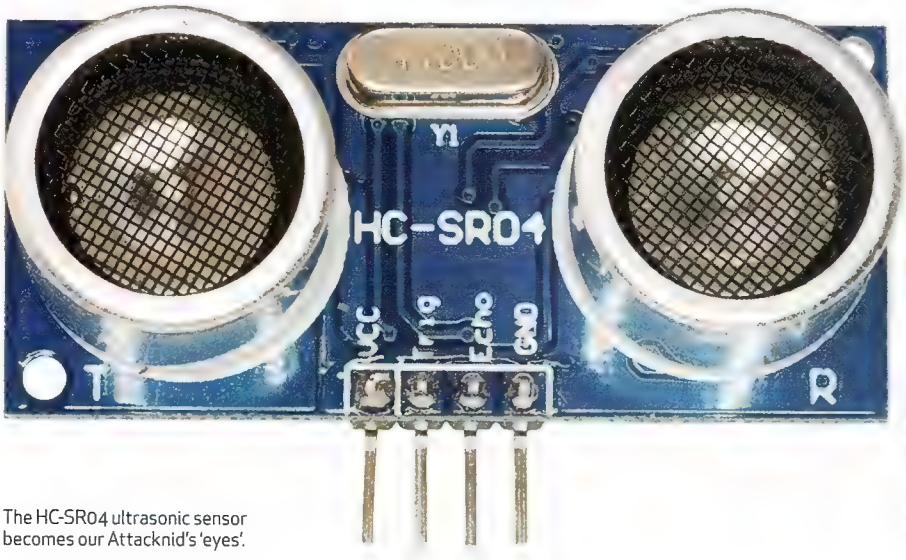
ENTER THE ATTACKNID

Combat Creatures' Attacknid robot made quite an impression in our editorial offices earlier this year. However, I have to admit I was more interested in how it worked than how it played. While it's driven by a 2.4GHz remote control, its low-cost and impressive battery life from just four AA-size batteries was intriguing. Having just built our Rolly robot at the time (*APC* February 2013), my immediate question was could the Attacknid be turned into a free-roaming bot with a bit of Half-Life headcrab-like magic?

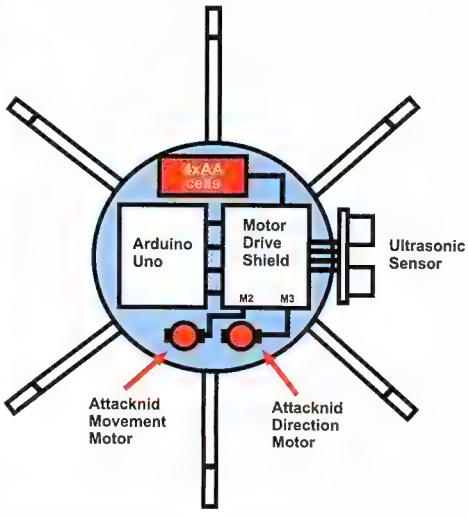
The hexapod is the clever design work of Jaimie Mantzel, a somewhat eccentric Canadian inventor. In fact, the Attacknid is really a miniature version of the Giant Robot Mantzel recently finished building (**tinyurl.com/mydthwm**). What makes Mantzel's design impressive is that despite its six legs, only two DC motors control its movement – compare that with the 12 servo motors minimum you'd find in any other six-legged walker.

DISASSEMBLY

First up, the Attacknid is quite modular – the weapons devices and controls essentially just 'plug' into the chassis via moulded DC plugs and are easily removed, revealing copious numbers of Size-0



The HC-SR04 ultrasonic sensor becomes our Attacknid's 'eyes'.



The block diagram of our Attacknid mod.

ATTACKNID MOD - PARTS LIST

COMPONENT	WEB	PRICE
ATTACKNID HEXAPOD	TINYURL.COM/N85YZR6	$129
ARDUINO UNO MICRO BOARD	TINYURL.COM/KF89EE8	$10.49
MOTOR DRIVE SHIELD	TINYURL.COM/MOBLS86	$5.00
HC-SR04 ULTRASONIC SENSOR	TINYURL.COM/KDBGPW3	$1.60
WIRE, PIN HEADERS ETC	JAYCAR ELECTRONICS, ETC	$5.00
TOTAL		$151.09

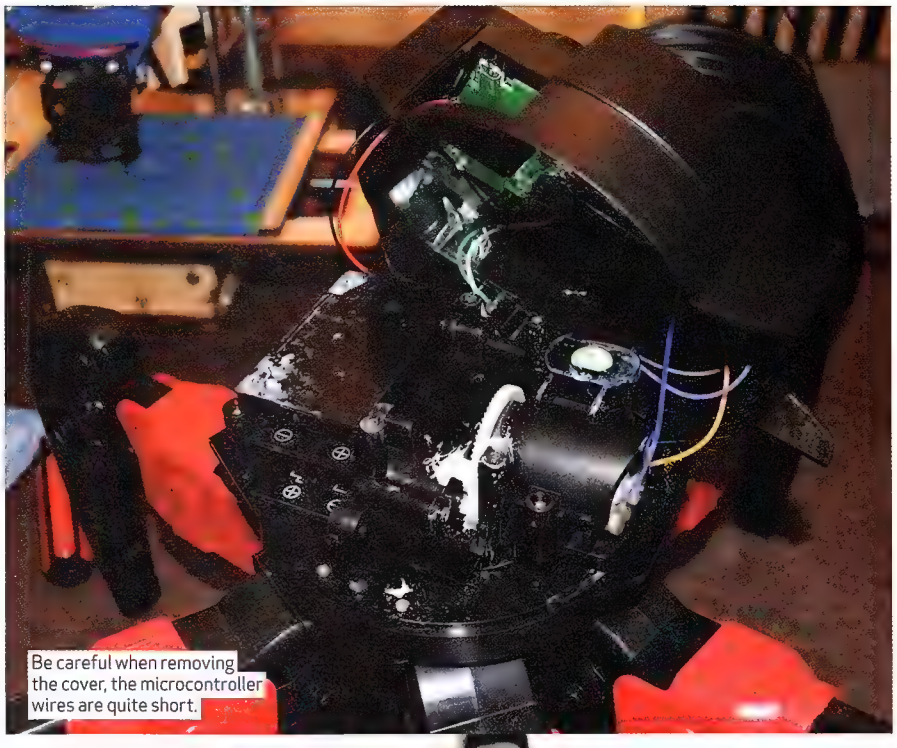
Phillips-head screws holding it together. However, once the weapons sections are removed, only four screws underneath the disc shooter mechanism hold on the 'head' cover. Remove the screws and the cover comes off. However, be careful, the Attacknid's microcontroller is anchored inside the top of that cover and has six short wires soldered to the battery case and the two motion motors. They're very thin and take nothing to break.

The microcontroller board is about the size of a CompactFlash card but houses everything for the Attacknid from the microcontroller to the 2.4GHz remote control circuitry to motor controllers.

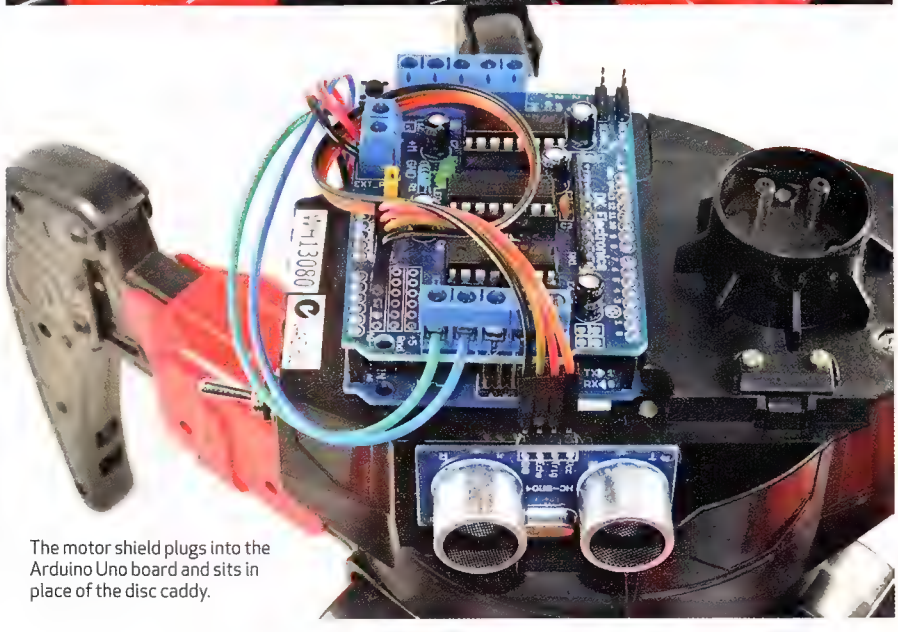
At this point, my first thought is to see whether the microcontroller board can be hacked, depending on the microcontroller it actually runs. However, you quickly find out that's not a great path to go down. There are two ways microcontrollers can be programmed – before they're soldered onto the board or 'in situ' via a JTAG (Joint Test Action Group), SPI (Serial Peripheral Interface) or similar port. The location of the board and the lack of obvious English-language markings make this difficult to search out.

And this is the thing – you can waste a lot of time reverse-engineering code or you can simply take functional control with your own controller and code. However, since I wanted to be able to restore original functionality to a device at a future time, I didn't want to destroy the original. So instead, I unsoldered the six wires at the motors and battery and taped them to the inside top of the cover. This also allowed me to get a good look at the motor drive mechanism. What surprised me most was just how small the DC motors are in this thing – both motion motors are about the same size as the motors in my Rolly robot project. They're just typical high-speed, low-torque 6VDC motors where the actual torque is geared up by two squillion-to-one through the complex gearbox.

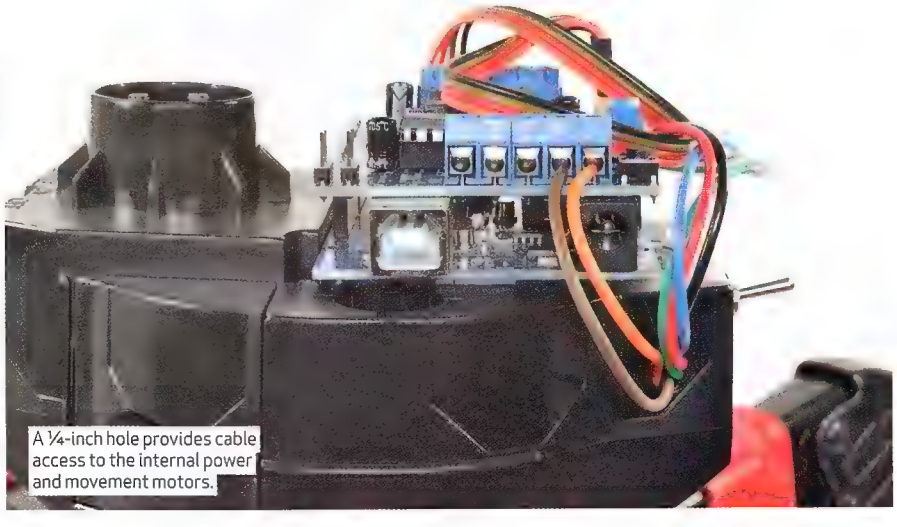
What's really interesting about the way the Attacknid works is that the whole head section – including the two DC motors – rotates on two separate gearboxes. The horizontally-opposed motor and gearbox handles forward/backward movement while the vertically-opposed motor provides direction through its own gearbox running around an annulus or ring gear that forms part of the head shell.



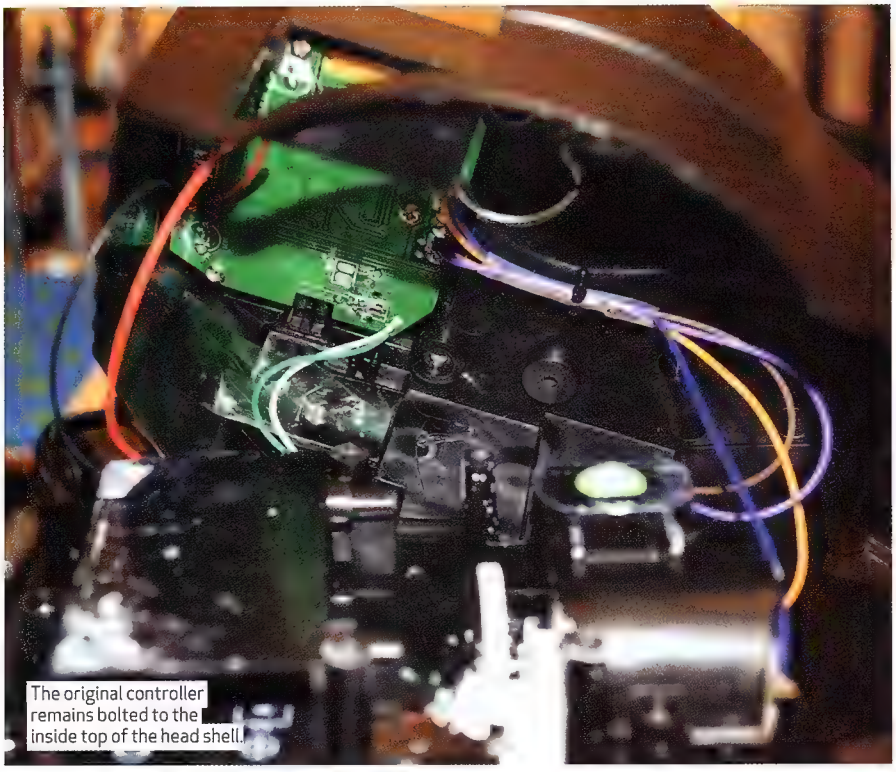
Be careful when removing the cover, the microcontroller wires are quite short.



The motor shield plugs into the Arduino Uno board and sits in place of the disc caddy.



A ¼-inch hole provides cable access to the internal power and movement motors.



The original controller remains bolted to the inside top of the head shell.

Also noticeable was the copious amounts of white silicon grease to keep the plastic gearboxes happy!

ADDING IN NEW FEATURES

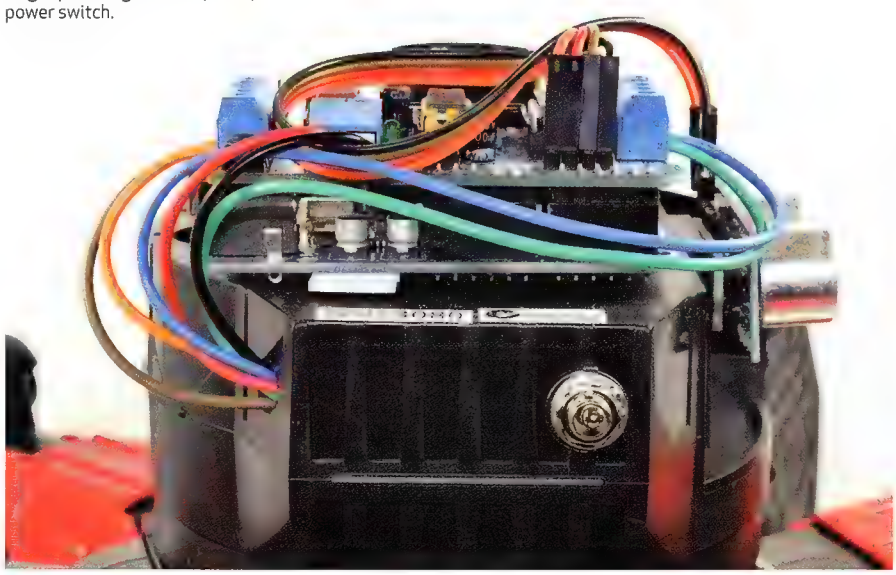
Since the goal of this project is to get the Attacknid to control its own movement, the remote control is superfluous – but it means we need a new method for setting direction and avoiding obstacles. If you've been following this series, it shouldn't be a surprise to you that I've added a low-cost HC-SR04 ultrasonic distance sensor – the same one I used in the Rolly and Stompy robot projects. In fact, Rolly also provided the other hardware – the Arduino Uno board plus the Motor Drive Shield.

At this point, a few quick assumptions had to be made. Not knowing the exact power consumption of the DC motors, but given their size plus the fact that four AA-size batteries lasted for around two hours, it was a pretty safe bet that they weren't going to overload the L293D motor controller chips on the Shield. To be safe, I also distributed control of the DC motors to one per L293D chip (they can drive two each) by using the Shield's M2 and M3 control inputs. Had the motors been noticeably larger, we'd have needed to parallel up the two sections of each L293D chip to handle the extra power demand.

What Rolly couldn't provide was the source code or Arduino 'sketch' – it just wouldn't work here. On the Attacknid, movement is set by the voltage on the main motion motor – set the polarity one way, it moves forward; set it the other way moves backwards. To set the motion direction, spinning the other motor rotates the whole robot head in one direction; swap the polarity and it rotates in the other direction. Wherever the head stops, that becomes the new plane of forward/backward movement.

Whatever else our sketch does, it has to accept input from the ultrasonic sensors and proportionally control the motors to get the desired outcome.

There's just enough room to install a single-pole, single-throw (SPST) power switch.



The Arduino Uno microcontroller, the brains behind our Attacknid hack.

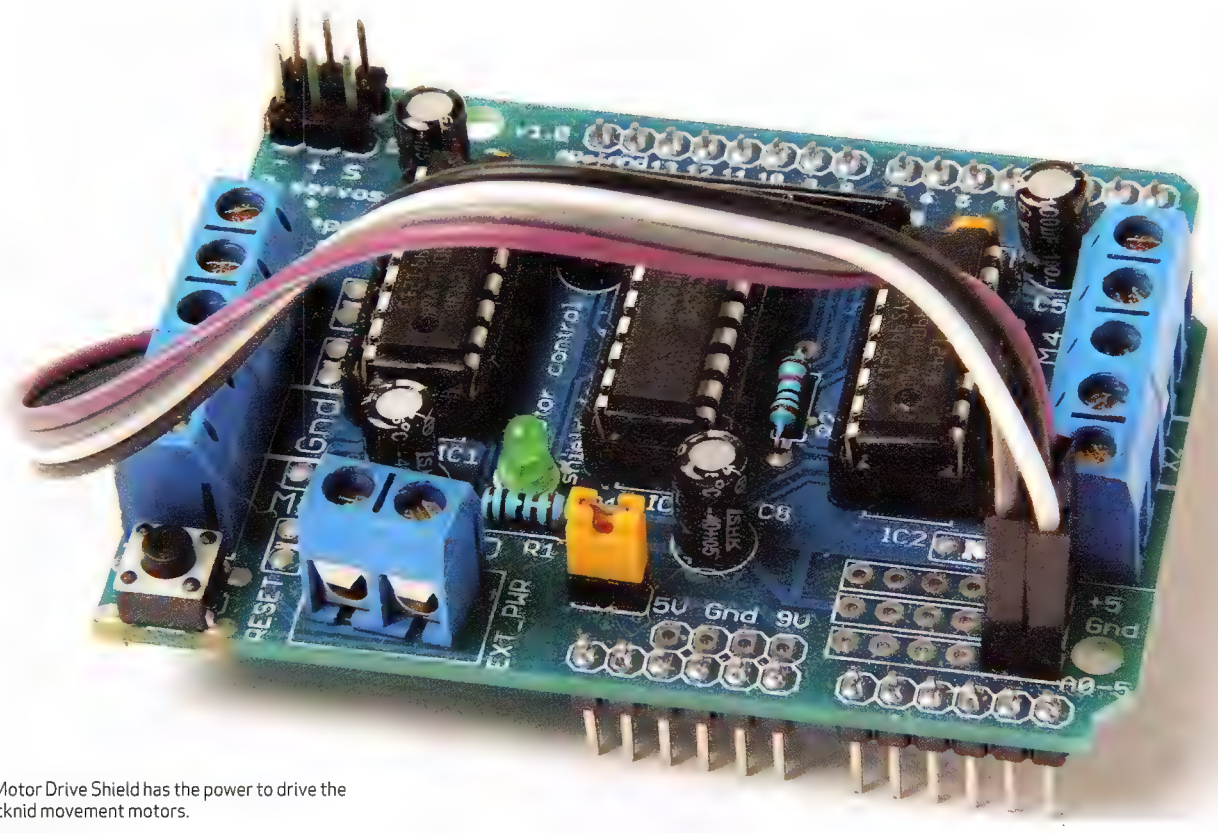
MODDING THE ATTACKNID

The downside with using the Arduino Uno and Motor Drive Shield is that neither is small enough to fit inside the Attacknid head unit. In fact, there is precious little room to do anything inside the Attacknid's head cavity.

There are other problems too – the first being to figure out how to bypass the built-in slide power switch with something of our own. And figuring out where it would fit. The built-in switch sits behind the original controller board right at the top of the head shell, but removing the controller and dealing with the wiring just isn't on my fun-list. But after poking around for a bit, there is just enough space on the side of the shell casing to fit a proper SPST toggle switch. Electrically, it sits in the same place as the slide switch – in series with the positive wire from the battery and the Motor Drive Shield power input (which also supplies power the Arduino Uno). But it's also exceedingly clear that these boards have to live on the outside of the Attacknid head shell. For the moment, I've double-sided taped them to the space vacated by the disc firing mechanism. But that also means we need some way to get the six wires from the internal battery connections and motors out to the Motor Drive Shield contact points.

The simplest solution is a single ¼-inch hole on the side of the chassis. The wires are then routed around the open gear systems inside to ensure they don't snag.

We've included a basic parts list for you to follow – apart from the Attacknid, the main components of our hack shouldn't cost you more than about $20 if you shop around. Of course, you'll need the usual tools such as a soldering iron, needle-



The Motor Drive Shield has the power to drive the Attacknid movement motors.

nose pliers and side-cutters to solder the wires to the motors, switch and battery compartment tags.

POWERING THE ARDUINO

When we originally designed our Rolly robot, one of the issues we had to address was the Motor Drive Shield resetting. The reason was that the two gearbox motors in that robot were drawing enough power to drop the supply voltage of the four-AA batteries fairly close to the Drive Shield's cut-off voltage. The Arduino would think Rolly was rolling along but the Drive Shield had reset, switching off power to the motors. The fix was to code the Arduino sketch to continually poll the motor drive shield, telling it the direction the motor should be spinning.

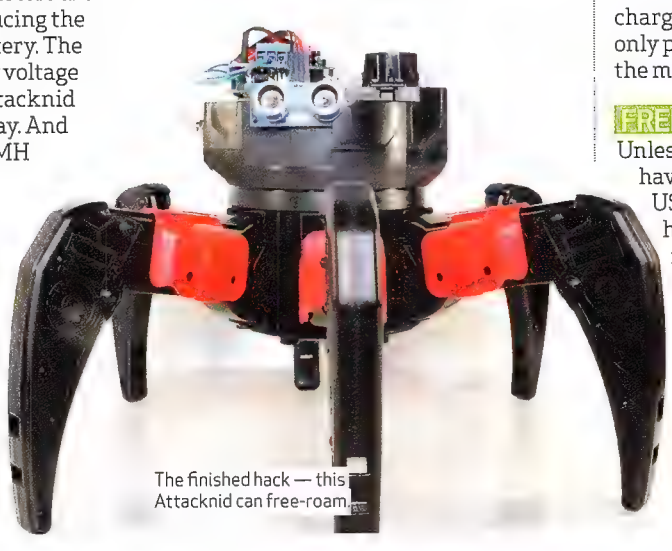
However, using the same shield on the Attacknid produces no such problems — we think it's because the two motors are much more highly geared, reducing the load on the motors and the battery. The reduced load means the supply voltage doesn't sag as much and the Attacknid can crawl along on its merry way. And yes, it works perfectly with NiMH rechargeable cells.

ANDROID SKETCH

Rather than bite off more than we can chew, our sketch this month simply gets the Attacknid moving on its own, avoiding obstacles and generally scaring people when they realise the remote control doesn't work anymore.

You can download the source code as usual from our Arduino web site at **apcmag.com/arduino.htm**. We recommend downloading and installing the latest 1.0.x version of the Arduino IDE from **arduino.cc** too. Once you've downloaded the source code, copy the contents of the 'libs' folder to your Arduino IDE's libraries subfolder, load up the sketch, compile it and load it up into your Arduino Uno board. We've had our Attacknid hack for several weeks and its works just fine.

When it first powers up, the head shell spins left 90-degrees, takes a distance measurement, spins right 180-degrees, takes another measurement and compares which is greater. It then spins the head shell to that direction and begins moving off. Taking continuous distance measurements, the Attacknid stops and quickly takes a backward step once an obstacle is measured to be less than 30cm away. It then follows the same process — spins left, right, compares the two and heads off.



The finished hack — this Attacknid can free-roam.

However, since the Attacknid motors provide no feedback, we have no accurate way of ensuring when the head shell is pointing 90-degrees left or right. The only way we can approximate it is by time — that means we spin the direction motor for a period of time that, based on testing, gets the head shell roughly pointing 90-degrees left and right of centre. You can adjust this in the sketch code.

The other feature included in the code is a temporary pause every 20 seconds. The reason? Since movement is now automatically controlled, I wanted a way of giving the plastic gearboxes a breather so that they weren't continuously ripping themselves to bits.

And finally, if you are using NiMH rechargeable cells, make sure they're full charged as the lower voltage of these cells only produces around 5VDC, not 6VDC, so the motors don't spin quite as fast.

FREEDOM!

Unless someone says otherwise, we now have the world's first Attacknid with USB input. Seriously though, learning how a device works and how you might replicate its functionality — or even add in new functionality — is a fantastic way to build your engineering skills.

While our Attacknid now has its freedom from human (remote) control, there's a pretty obvious next step: returning the weapons system and the ability to fire at will. We'll come back to our 'a-hack-nid' in a future issue.

downtime

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Total War: Rome II

Prepare for the biggest battles the PC crowd has ever seen.

The Roman senate will weep for Crassipes. They'll talk proudly of how the great general threw himself against the walls of Massalia. They'll talk of how he burned the gates and took the central square, and how a dozen Averni javelins ended his illustrious command of the First Legion there. But will they talk of the fleet barely a mile away that sat still and watched the great man lemming his way into the history books? Do they realise that the patriot they adored was sent intentionally to his death? We wonder what that would do if they knew that the fate of Crassipes and all the armies and settlements of Rome were not beholden to the gods, but to one bearded games journalist moving them like pawns on a vast playing board.

What a beautiful board it is – an intricate papier mache caricature of Europe, decorated with landmarks, rivers and exaggerated topography. *Total War* has come a long way from the papery maps of *Shogun*, but its form is the same. You must guide your chosen nation to glory by managing cities, conducting diplomacy, plotting espionage and moving armies to conquer new settlements. When your armies meet resistance, you dive into a real-time battle and command the troops personally.

PAWNS WITH FACES

In contrast with the focused, shorter campaigns of *Napoleon* and *Shogun 2*, *Rome II* hauls *Total War* back onto the global stage for a huge and varied campaign. It's 272 BC, and nine playable nations and dozens of others – from Britannia and north Africa, to Macedonia and Syria – are all elbowing for space. Rome sets its wardogs against Celtic berserkers in the west, Greece flexes its cultural muscle to gain support in the central plains. In the east, Egypt enslaves nations with its chariots and war elephants.

This is grand strategy at its most ambitious, not least because *Rome II* is committed to giving the pawns you're sacrificing faces, voices and personalities of their own. That's why we felt a twinge of regret about poor Crassipes.

Generals are vital resources in *Rome II*.

Previously, you could raise tiny armies of a couple of soldiers and a leader would be picked from their ranks. Now troops cannot move at all unless they have a general, and the number of generals you can have is limited by the size of your empire. The legions they command are also persistent entities that can gain stat-buffing 'military tradition' affixes over time. It's a significant shift that affects everything from how armies are constructed to how territories operate on the map.

Territories are now grouped into 'provinces' which can be boosted by production-boosting edicts if you own them entirely (useful for swift social engineering in the face of food shortage), and your cities' buildings now have province-wide influence. Construct a high-grade military training building in Rome and the troops you unlock can be recruited by generals in the field, anywhere within the Italia region, sparing them the long walk from their barracks to the battle.

AGENT, SPY OR CHAMPION?

These changes are designed to reduce the number of moving parts on the board without diluting *Total War's* logistical complexity. For the same reason, farms, mines and other supporting buildings now sit within city borders where formerly they were scattered across the campaign map like chickenfeed for tiny enemy warbands to peck at.

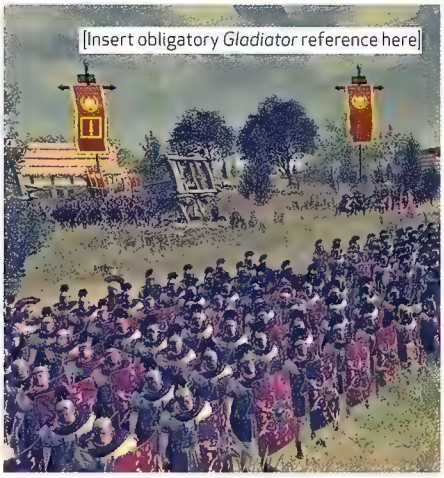
This means the ability to target individual aspects of a region's infrastructure is sacred to agents. As with previous *Total War* games, agents are figures that can be moved around the board independently, or embedded in armies and enemy cities to disrupt your opponents' movement, assassinate their generals, or enhance the abilities of your own.

The army limit and condensed targets encourage grander strategic gestures. Where in *Shogun 2*, we might spend time using small forces to devastate a region's resources before amassing them again to take the territory, in *Rome II* we'll build a huge army and march it up to

Those herald bearers must have serious balls of steel.

The Beard: The must-have accessory for any warrior.

The sea battles in *Rome II* are hardly graceful, but they're still an entertaining ruckus.


[Insert obligatory *Gladiator* reference here]

the doors of their huge city, and then we'll have a huge fight to decide who gets to keep it.

BIGGER IS ALWAYS BETTER

Armies are also more flexible thanks to a variety of stances, which can let them move extremely quickly with 'forced march', create a wooden outpost at their location with 'fortify', or lay an ambush on the strategic map. The map has been designed with these stances in mind, so you can dominate large regions with clever use of choke points. Alliances are now extremely worthwhile as well. Allied and client states (who will sit quietly and pay you a tithe every turn in exchange for their lives) contribute to your settlement count for victory conditions, and you can poke your pro-active pals in the right direction with a new diplomacy option that lets you target settlements you want to take control of.

Rome II's battles are stunning. Troop body language and behaviour has received plenty of attention. If a unit is under fire they'll lift up their shields for cover. They'll erupt into rowdy celebration when they rout a unit, and you'll see the exhaustion of the fleeing enemies in their gait. A cinematic battle-cam puts you right into the melee, where you'll hear men yelling to each other and see differences in the way units fight. Praetorians use their huge shields to haul barbarians over and behind them to be stabbed by supporting ranks. Attack dogs, released from their handlers, tear into a fight with terrifying speed and drag down opponents with a flying bite to the arm.

If you encounter an exotic unit you like, you might be able to recruit them as mercenaries for a high ongoing cost. These are the only troops you can hire in enemy territory, but Romans can construct auxiliary barracks that will let you recruit other factions' units properly. This reflects how the Roman army historically used foreign troops and encouraging a sort of military tourism. We're still on a quest to unite elephants and Celtic skirmishers in the same army.

The battlefields are better, too. They vary hugely depending on weather conditions and location, and are enhanced by the new line of sight system. If your troops can't see an enemy, nor can you, which means every hillside undulation can hide an enemy unit if you don't scout a little. The resulting guessing game keeps the marching portion of the fight interesting and makes fights feel faster. The new engine also allows for properly realised cities. Major capitals like Rome and Carthage have their own spectacular custom-made maps, and there are variations in the wider world for land and coastal towns, which also vary completely in style and structure depending on their cultural origin.

Rome II feels glacial even compared to *Empire*. You won't complete a campaign on a Sunday afternoon, or over a weekend. Expanding across such a huge board takes time, and the balance between keeping public order in just-conquered territory and starting new invasions is a constant concern that stopped us from running slipshod over the map. Managing the correct balance of buildings sometimes felt more like admin work than empire building when juggling multiple territories, though we did find that we had more money than we could spend once we'd amassed enough settlements.

At the time of release, *Rome II* does have its flaws, but it's still a sumptuous, slow-burn strategy game with some of the best land battles in the series to date. Aesthetically speaking, it's a triumph. Empire management, alliances, the UI and battlefields have all improved, which makes it doubly frustrating to encounter the floppy AI that will be extremely familiar to *Total War* fans by now. Still, nothing out there does what *Total War* does with this degree of scope and detail. ■ **Tom Senior**

Verdict

Fight past the niggles and you'll find a truly epic grand strategy game with a tremendous sense of spectacle.

★★★★½

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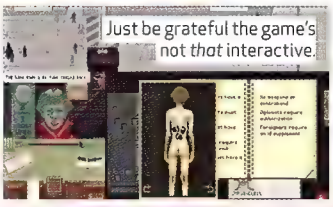
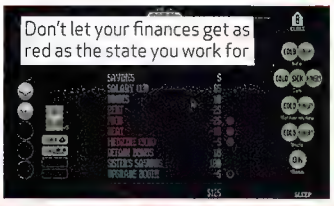
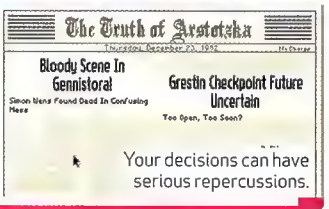






US$10 | PC VIA STEAM | WWW.PAPERSPLEA.SE

Papers, Please

Darkly compulsive, Papers, Please is more than just a borderline success.

***Papers, Please* is the intersection of efficiency and intrigue. You're an immigration checkpoint officer for a fictional, pseudo-Soviet state back in 1982, and it's your job to vet the foreigners and returning natives who want to cross the border. You do this by scrutinizing their personal documents for inconsistencies – expired forms, faked ID photos and mismatched fingerprint records.**

It might sound mundane, but spotting a mislabelled gender or a forged stamp produces real pride, and *Papers, Please* keeps boredom at bay by gradually introducing incentives for bending or breaking the rules. Checkpoint guards offer to slip you extra money if you detain more people. A drug smuggler will offer you a bribe for letting them across the border. A wife without an entry form might plead to be let through so she can be with her husband. These interactions disrupt the pleasant, analytical brainwork of scanning and stamping.

Over time, plot lines emerge from characters and factions that test your empathy and loyalty, at the centre of which is the well-being of your own family, who depend on you for money. Each workday terminates with a score screen where your earnings, penalties and bribes are tabulated alongside your living expenses.

The mental-emotional tug-of-war is impressive, and owes a lot to perfect pacing. The set of rules you judge people by, and your tools for doing so, grow with your competency. United Federation citizens might be prohibited one day. You might receive orders to confiscate certain passports. A new type of form might be required. It's thoughtfully balanced in a way that stays just a step ahead of you in difficulty as you become a more efficient bureaucrat.

My enthusiasm for *Papers* sank a little when I realised how much the game's interesting characters – such as the recurring encounters with members of a secret organisation – are scripted to appear at set moments. Replaying *Papers*' early stages a second or third time feels like busywork, as you're stuck doing elementary checks on basic forms. In these ways *Papers* simply shows the limitations of being a game made by a single person. There are 20 endings for the story, but some are small variations, and not all have unique art to express them. Likewise, your family, the crux of your motivation, is only represented with text which is a missed opportunity to get more emotional investment out of players with, say, a depressing pixelated depiction of an ill mother-in-law.

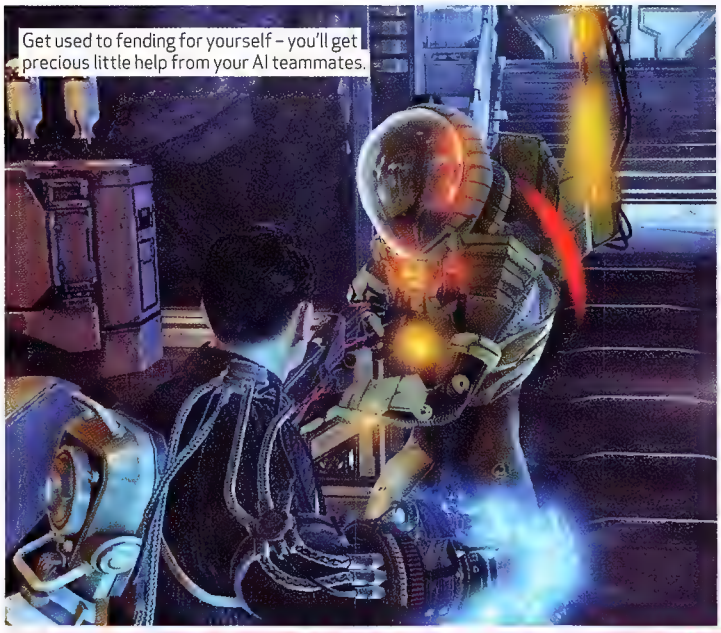
An Endless mode alleviates some of Story mode's monotony by enabling you to compete on leaderboards for prestige, but above all *Papers, Please* is a $10 ticket to emotional manipulation, left-brain stimulation, and elegantly-paced virtual paperwork wrapped in clever storytelling.

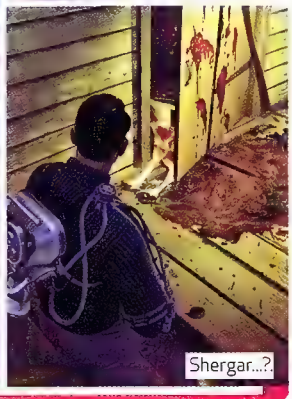
■ Evan Lahti

Verdict

An original and pleasantly demanding puzzle game that leaves you wanting slightly more variety.

★★★★½





US$80 | PC VIA STEAM, XBOX 360, PS3 | WWW.THEBUREAU-GAME.COM

The Bureau

XCOM quits field work, skips the cushy desk job and jumps straight to retirement.

The *Bureau: XCOM Declassified* underwent a tumultuous development, so it's understandable that some of its pieces are polished, but few of them fit together. And that the resulting jumble is best forgotten in favour of last year's far-superior *XCOM: Enemy Unknown* or recent third-person action games such as *Saints Row IV*.

Early '60s America is painstakingly recreated then obliterated by an all-out alien invasion that only the fledgling XCOM organisation can stop. The world-building is top-notch, down to the omnipresent cigarettes and unironic fedoras, and I felt a real sense of outrage at the perversion of these quaint communities.

Unfortunately, exploring this gorgeous world is a chore. As agent William Carter, you command two other agents in a manner similar to *Mass Effect*, and Activating Battle Focus slows time, enabling you to coordinate special attacks, forcing enemies out of cover and into crossfire.

Sadly, my squadmates require constant babysitting, and I feel like I'm doing all the work, making headshots and racking up kills by a factor of 10 to one. During one firefight, an alien grenade lands at the feet of an agent. He ducks and rolls into a wall, and the grenade goes off at his feet. "I need some healing here!" he yells. I question the calibre of his training.

The pace feels uneven. Missions throw me into back-to-back firefights that leave me short of ammo and barely hanging on, but immediately after, I can wander through empty farmhouses and deserted streets for long minutes without seeing a single enemy or NPC. A chunk of every level feels artificially vacant, as though it was emptied at the last minute.

Out of combat, I spin my wheels back at the borderline-useless headquarters. There are no autopsies or research facilities, so your time there quickly becomes tiresome. When I finally receive a mission, it's a petty quest that sends me running to the far corners of the bunker.

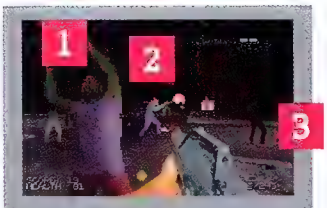
The HQ segments have no firm relationship with what you do in missions. At one point research director Dr Heinrich tells me to retrieve alien weapons so they can be studied and reproduced, but I can pick up any alien weapon and use it immediately. In the most extreme instance, I find a shiny new pulse rifle and give two of them to my squadmates – all without knowing how they work.

The Bureau pays lip service to series essentials like permadeath and technology acquisition, but it fails to include them in a way that makes sense. The biggest sin is the absence of the terror that made me agonise over every decision in *Enemy Unknown*. *The Bureau* misses all of the things that make *XCOM* thematically interesting, and all that's left is an imposter in *XCOM* clothes. ■ Ian Birnbaum

Verdict

The Bureau: XCOM Declassified feels confused and half-finished, a hollow but beautiful slog through *XCOM*'s early years.

★★★☆☆



Shambles

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2

3

The Light

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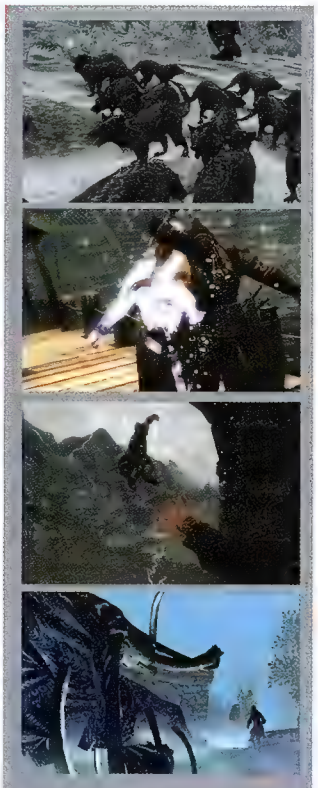

Gifts of the Outsider

THE DOVAHKIIN, DISHONORED

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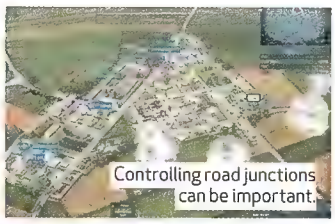
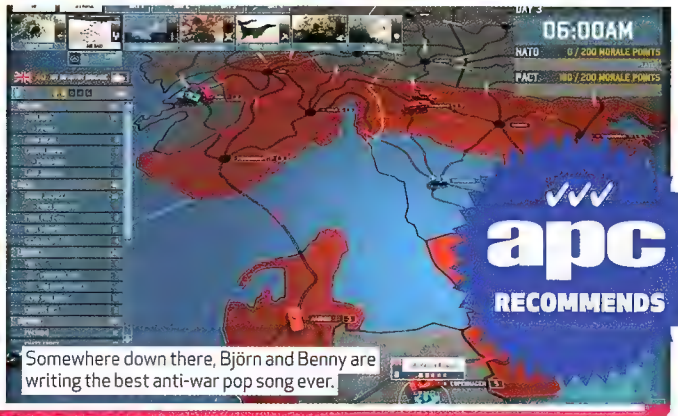
One of these vehicles is tough as old boots. The other is a Patton tank.

Officially Sweden's scruffiest carpark.


Controlling road junctions can be important.

Orders are best issued from height...



Somewhere down there, Björn and Benny are writing the best anti-war pop song ever.

apc RECOMMENDS

US$40 | PC VIA STEAM | WWW.WARGAME-AB.COM

Wargame: AirLand Battle

Ever wanted to coordinate the Cold War with a mixture of tanks and stats? Read on...

RAF Tornados wheel like hungry buzzards while a line of British Army Centurions pushes northward, pulverising everything in its path. Another chunk of Denmark is on the verge of liberation when the bottom-left corner of the mini-map suddenly starts looking a little weary.

There are Soviet T-55s and BMPs running amok in my rear echelons! My foe has used a coast road to bypass my careful defences. I'm about to congratulate him on his canniness when I remember I've been playing solo for the last hour. Eugen's latest Cold War RTS features an unusually clever AI adversary.

Those familiar with *Wargame: European Escalation*, the minor masterpiece that was *AirLand's* predecessor, won't be surprised to hear that this is another fast-moving tactics game focused on manoeuvre and territorial control rather than base building, resource gathering and the rigmarole of tech-tree clambering.

Your watchtowers are keen-eyed scout cars and helos. Your HQs are the tracked or wheeled command vehicles necessary for seizing map zones. Strongpoints are the villages, towns and thickets occupied during an advance. Depending on game mode, victories can be achieved by eliminating enemies, capturing a set number of map zones or destroying all hostile HQs. In the new Scandinavian dynamic campaigns, all battles end rather abruptly at the 20-minute mark. The tight time limits seem restrictive until you realise that outright wins are rarely essential. Because campaigns run for up to 20 days and involve turn-based strategy map conquest, draws and defeats are delays and setbacks rather than exasperating cues to replay scripted scenarios. That East German battlegroup in Malmo might have survived 1,200 seconds of breathless British belligerence, but it has lost ground and is now weakened.

Embellishing the high-level strategy map decisionmaking are interesting Europa Universalis-style event dialogues – should I transfer my Screamin' Eagles battlegroup to off-map South Korea, in the hope it persuades Kim Il-sung to stay out of the European war? – and a tempting array of strategic instruments. The same territory-linked Political Points that fund the deployment of new battlegroups also pay for pre-combat actions like recon sorties and tactical nuclear strikes. Like the singleplayer, multiplayer feels honed and brimming with possibilities – the handiwork of an experienced studio at the top of its game. Participate in one of the large team matches and you'll find that it's still fun, regardless of skill.

While the player that learns every stat will do well, a bit of common sense goes a long way. *AirLand's* secrets are simply those of 20th century warfare.

■ Tim Stone

Verdict

Wargame: AirLand Battle is European Escalation escalated: more Cold War kit, more tactical tension and more replayability.

Idle hands are the devil's tools

Smartphone lockscreens aren't impregnable. We know this because time and time again the internet lights up with scattershot reports detailing the latest iOS or Android random-gesture-combo loophole that effectively enables any would-be phone unlocker to stealthily bypass your passcode. At time of writing, the latest flare-up concerns iOS 7. No doubt this particular exploit will have been patched via an Apple software update by the time you read this, but the amusing bit is the story of the guy who discovered the flaw. Jose Rodriguez, a soldier living in Spain's Canary Islands, is what you might describe as an expert lockscreen bypasser. As he told Forbes, he discovered his unusual hobby in a previous job as a driver for government officials, playing with his phone as he waited for his passengers: "I had a lot of time to look at the scenery, break the phone or write poetry while waiting for my boss... [But] I don't write poetry and already knew the landscape by heart." The result? Jose would spend hours "trying everything that goes through my head... I submit my iPhone to cruel methods of torture." So, to any would-be phone unlockers with too much time on your hands... *that's* how it's done.

Don't believe the hype

Okay, so we already knew that we couldn't believe a lot of those bogus-sounding reviews of products and services on the internet, but we had no idea how widespread – and professionally orchestrated – the problem was. A year-long crackdown in New York targeting commercially run fake review providers in the US and the clients that employ their services has revealed a complex web of dodginess, and it's not just seemingly harmless fake restaurant reviews either (best steak ever!). According to the NYT, businesses touting bogus write-ups include tour bus operators, teeth-whitening services, a laser hair-removal chain, an adult entertainment club, plus lawyers, dentists... and even an ultrasound clinic. Yikes. Best baby scan ever!

Operation Payday

There have always been rumours dogging Nokia CEO Stephen Elop during his recent tenure at the helm of the Finnish mobile giant. The gist being: the former Microsoft man was a Redmond mole of sorts, planted for some nefarious Windows-esque purpose. The primary evidence: he curiously opted to exclusively back Windows Phone in 2011 – the OS a pipsqueak then, a minnow now – when every other vendor was jumping on board the Android bandwagon. Well, the conspiracy theorists must be feeling pretty smug now, after Microsoft announced it was in fact buying most of Nokia (a deal carefully negotiated with the involvement of none other than one Stephen Elop). And how many pieces of eight does he collect for this alleged inside job? A cool US$25.5 million executive farewell as he leaves Nokia to rejoin Microsoft. Certainly not bad takings for three years' work... Or 'well played, sir' as the tin-foil-hat brigade might put it. ■ **Peter Dockrill**

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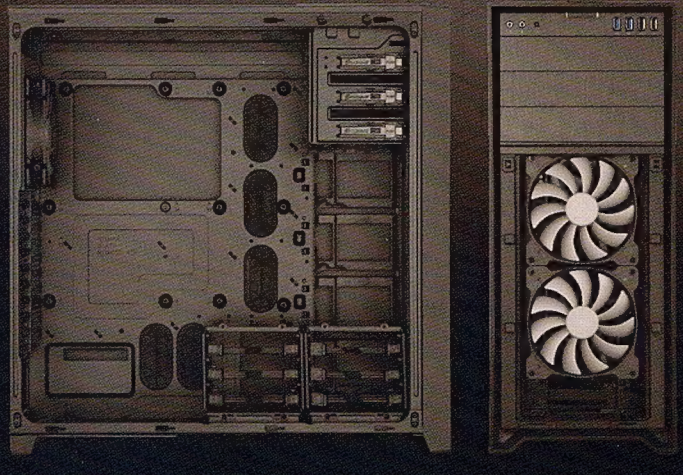

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